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Original Research Article

Randomized Controlled Clinical Assessment of the Postoperative Analgesic Efficacy of the Pulmonary Recruitment Manoeuvre (PRM) Versus Intraperitoneal Hydrocortisone in Laparoscopic Gynecological Surgeries

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Abstract

Aim: To investigate the PRM is superior to intraperitoneal hydrocortisone instillation as regards postoperative pain reduction in patients who have undergone laparoscopic gynecological surgery.

Material & Methods: This is a prospective, randomized, controlled study was conducted in the Department of Anesthesiology, Lord Buddha Koshi Medical College & Hospital, Saharsa, Bihar, India, during one year time period. Ethical approval from the ethics committee and informed consent was obtained. 90 patients were included (30 in each group) in the study.

Results: There was a statistically significant difference between both the hydrocortisone and the pulmonary recruitment groups in comparison with the control group as regards 24 h postoperative total analgesic consumption, P value <0.001**.**

Conclusion: Intraperitoneal hydrocortisone and pulmonary recruitment manoeuvre could both effectively reduce pain after gynecological laparoscopic surgeries, however, intraperitoneal hydrocortisone might give a longer pain-free time.

Key words: Hydrocortisone, pain, pulmonary recruitment

Introduction

Laparoscopic procedures are termed invasive; however, they must be considered less invasive when compared with their open counterparts with regard to the amount of peritoneal injury and tissue trauma, which are the main determinants of the extent to which surgery is radical. [1]

Following laparoscopic gynecological surgery, a rapid return to normal activity, shortening of hospital stay, decreased morbidity, and lower costs are related to improved postoperative pain management. Postoperative pain is unpredictable, which accounts for the need for a systematic

approach to prevention of pain before the patient wakes up after anesthesia. [1]

Visceral pain has its maximal intensity during the first postoperative hours and is exacerbated by coughing, respiratory movements and mobilization. The fact that the pain comprises several components accounts for the necessity for multimodal analgesic techniques for provision of effective postoperative analgesia. [2]

Currently, the efficacy of pain relief via the intraperitoneal route is controversial. Intraperitoneal administration of medication has been shown to be effective in some studies. [1, 3, 4]

Although PRM and intraperitoneal hydrocortisone are reported to be effective, no head-to-head comparison of the two methods was done.

Thus, we aim to investigate the PRM is superior to intraperitoneal hydrocortisone instillation as regards postoperative pain reduction in patients who have undergone laparoscopic gynecological surgery.

Material & Methods:

This is a prospective, randomized, controlled study was conducted in the Department of Anesthesiology, Lord Buddha Koshi Medical College & Hospital, Saharsa, Bihar, India**,** during one year time period. Ethical approval from the ethics committee and informed consent was obtained.

Female patients aged between 20 and 45 years, scheduled for diagnostic laparoscopic gynecological surgeries done as a part of infertility management were enrolled to participate in this study. Patients refusing to participate in the study, patients with a history of chronic pain, those with chronic respiratory disease, advanced renal, hepatic or cardiac diseases, and patients on opioids, tranquilizers, or steroids were excluded from the study. The day before surgery, all patients had pre-anesthesia check-up with routine and subjective investigation as per requirement. The visual analogue score (VAS) was explained to the patients (where 0 = no pain and 10 = worst imaginable pain). A written valid informed consent was obtained from the patients.

In the pre-anesthesia room 1 h before the procedure, a 20-gauge cannula was inserted peripherally and the patients were premedicated with intravenous (IV) midazolam 0.02 mg/kg, pantoprazole 40 mg, 10 mg metoclopramide before induction of general anesthesia. After preoxygenation with 100% oxygen (O2) for 3 min, anesthesia was induced with IV propofol 2 mg/kg, 1 μg/kg of fentanyl followed by 0.5 mg/kg of atracurium to facilitate endotracheal intubation. Anaesthesia was maintained with isoflurane 1-1.5% in 100% O2 and a state of muscle relaxation was maintained by IV atracurium 0.1 mg/kg every 30 min with volume-controlled mode of mechanical ventilation and adjusted parameters to keep end-tidal CO2 between 35- and 40-mm Hg. All patients were continuously monitored by electrocardiogram (ECG), repeated non-invasive arterial blood pressure measurement every 5 min, and continuous end-tidal CO2 and arterial oxygen saturation (SpO2) by pulse oximetry. IV paracetamol 1g in 100 ml infusion over 15-20 min, was given 30 min before the end of surgery.

Laparoscopy was done using CO2 as a distension medium. First, the Veress needle was introduced through the lower border of the umbilicus. A water test was done to confirm intraperitoneal placement.

Then, the correct distension pressure was ensured when no dullness was felt over the lower border of the liver. The intraabdominal pressure was maintained between 12 to 14 mmHg. The patient was placed in the Trendelenburg position to provide optimum conditions for the laparoscopic view. A 10 mm laparoscopic trocar was introduced with

45 degrees towards the pelvis and a zero camera was introduced through the cannula trocar. The second puncture could be done through the right or left iliac fossae. By the end of the operation, using a computer-generated randomization schedule, patients were randomly assigned into three equal groups:

Group (A) (hydrocortisone group), in which patients received intraperitoneal 100mg hydrocortisone in 150 ml normal saline in addition to routine method to remove CO2.

Group (B) (pulmonary recruitment group), in which CO2 was exsufflated by pulmonary recruitment maneuver performed manually using five positive pressure ventilation at a maximum pressure of 40 cmH2O. The fifth positive pressure inflation was held by anaesthesiologist for approximately 5 s with the valves on the operative ports opened fully at end of surgery in addition to the routine method to remove CO2.

Group (C) (control group), in which the routine method was performed by applying gentle abdominal pressure and removing CO2 by passive exsufflation through the port site at the end of the surgery.

Residual neuromuscular block was antagonised with IV atropine 0.01 mg/kg and neostigmine 0.05 mg/kg and extubation was done according to the extubation criteria.

In the recovery room, patients were asked about post-operative shoulder and upper abdominal pain. Pain severity was assessed using the VAS. Pain with VAS score more than 3 was controlled using meperidine in increments of 20 mg every 20 min until the VAS is ≤3. Then, the patients were discharged to the ward according to the standard criteria. In the ward, postoperative 24 h total analgesic consumption and time of first rescue analgesic request were recorded. Patients were also asked to fill a questionnaire at 1,6,12, and 24 h postoperatively using the VAS of pain severity. Vital measurements, (blood pressure and heart rate) were also recorded hourly for the first 24 h. The primary outcome was the first 24 h total analgesic consumption. The secondary outcomes were the time for the first request of analgesia in minutes, pain score (VAS), mean arterial blood pressure, heart rate in the first 24 h postoperatively and the incidence of postoperative nausea, vomiting, or abdominal distension.

90 patients were included (30 in each group) in the study. Statistical Package for Social Sciences (SPSS) software was used for statistical analysis. Numerical data were presented as mean ± standard deviation or median (interquartile range). Categorical data were presented as frequency (percentage). Analysis of variance (ANOVA) test was used to compare the three groups regarding normally distributed numerical data. Chi-square test was used to analyse categorical data.

Results:

The study groups were comparable with respect to the demographic profile baseline values of haemodynamic variables and surgical duration; there was no statistically significant difference between the three groups [Table 1].

Table 1: Demographic data and baseline haemodynamic variables data expressed as mean ± standard deviation

Demographic data	Group A (n=30) hydrocortisone	Group B (n=30) Pulmonary recruitment	Group C (n=30) Control	P
Age (years)	30.3 ± 2.4	28.7 ± 3.2	29..6 ± 3.9	0.582
Weight (kg)	71.4 ± 5.4	70.5 ± 5.8	70.4 ± 4.0	0.661

Duration of surgery (min)	52 ± 4.3	55.7 ± 9.4	55.2 ± 10.4	0.652
Baseline HR (min)	73.6 ± 5.1	73.4 ± 5.1	73.4 ± 5.1	0.471
Baseline MBP (mmHg)	74.6 ± 5.1	73.5 ± 5.0	73.2 ± 5.0	0.203

There was a statistically significant difference between both the hydrocortisone and the pulmonary recruitment groups in comparison with the control group as regards 24 h postoperative total analgesic consumption, P value <0.001. Also, the first request for analgesia was less in both the hydrocortisone and the pulmonary recruitment groups as compared to the control group with a significant P value <0.001. There was no significant difference as regards the total analgesic consumption between the two intervention groups [Table 2].

Table 2: Post-operative total analgesic profile. Data expressed as mean ±standard deviation

Postoperative analgesic profile	Group A (n=30) Hydrocortisone	Group B (n=30) Pulmonary recruitment	Group C (n=30) control	P
Total analgesic (meperidine) consumption (mg)	21.4* ± 12.5	26.8** ± 12.4	58.9 ± 15.4	<0.001*
Time to first rescue analgesia (min)	45.9* ± 7.7	45.2** ± 8.6	26.8 ± 9.2	<0.001*

The patients in the three groups were similar regarding the frequency of postoperative nausea and vomiting [Table 3].

Table 3: Postoperative nausea and vomiting (PONV). Data expressed as number and percentage

	Group		
	Group A (n=30) Hydrocortisone	Group B (n=30) Pulmonary recruitment	Group C (n=30) control
	Count	Count	Count
PONV			
Yes	9	10	18
No	21	20	12

Discussion:

In 2003, Tas¸ et al. reported results of a systematic review which evaluated the interventions to alleviate shoulder pain after laparoscopic surgery for the benign gynecologic condition, is review included three RCTs for assessing the effectiveness of PRM alone compared to abdominal compression or IPS, is review proposed that PRM using a pressure of 40 cm H2O is a simple and cost-effective method to reduce shoulder pain after laparoscopy for benign gynecological conditions [7].

The second systematic review to investigate the effectiveness of PRM in reducing shoulder pain occurring after laparoscopic surgery was published by Pergialiotis et al is review included five RTCs in which four RCTs were conducted among women undergoing laparoscopic gynecologic surgery. Comparisons in this review included PRM alone versus abdominal compression (four studies) and

PRM combined with IPS versus abdominal compression (one study). The authors noted that PRM performed either alone or in

combination with IPS significantly reduced the intensity of shoulder pain at 12, 24, and 48 hours [8].

Less well studied is whether low inspiratory pressure PRM is as effective as higher pressure for reducing postlaparoscopic shoulder pain. Ryu et al. [9] compared PRM that applied a maximum pressure of 40 cm H2O with IPS to PRM at a pressure of 60 cm H2O with IPS and noted no significant differences in the intensity of shoulder pain at 24 and 48 hours between the two comparison groups. Interestingly,

Lee et al. [10] compared PRM at a maximum pressure of 30 cm H2O to abdominal compression and observed a significant reduction of shoulder pain score at 24 and 48 hours among participants assigned to treatment by low-pressure PRM.

Amini et al. in 2014 also used intraperitoneal 100 mg of hydrocortisone in 250 mL of normal saline with the same technique as in comparison to intraperitoneal 100 mg bupivacaine in 250 mL normal saline and they found that there was no difference between the patients as regards pain scores compared to the bupivacaine group. The patients were similar regarding postoperative analgesic requirements, return of bowel function, nausea, and vomiting. [101 In a similar study, Zahra Asgari et al. studied the effect of dexamethasone added to intra-peritoneal bupivacaine on postoperative pain after gynecological surgery and concluded that combination to be more effective than bupivacaine alone. [12,13]

Conclusion:

Intraperitoneal hydrocortisone and pulmonary recruitment manoeuvre could both effectively reduce pain after gynecological laparoscopic surgeries, however, intraperitoneal hydrocortisone might give a longer pain-free time.

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