e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2023; 15(5); 222-228

Original Research Article

The Efficacy of Intraperitoneal Instillation of 0.125% Levobupivacaine versus 0.2% Ropivacaine for Postoperative Analgesia after Laparoscopic Gynecological Surgeries: Comparative Study

Midhu V. Nadh[1], Silpa. A. R[2], Arun Aravind[3]

[1]Assistant Professor in Anaesthesiology, Sree Narayana Institute of Medical Sciences, Chalakka, Cochin

[2]Assistant Professor in Anaesthesiology, Sree Narayana Institute of Medical Sciences, Chalakka, Cochin

[3]Assistant Professor in Anaesthesiology, Dr. Moopen's Medical College, Meppadi, Wayanad, Kerala

Received: 26-02-2023 / Revised: 24-03-2023 / Accepted: 30-04-2023

Corresponding author: Dr. Midhu V. Nadh

Conflict of interest: Nil

Abstract

Background and Aim: Most of the gynecological surgeries are now performed under laparoscopy guidance and though it is minimally invasive, majority of the patients suffer moderate to severe pain in the immediate post operative period. Intraperitoneal instillations of local anaesthetic ropivacaine or levobupivacaine with buprenorphine as adjuvant were compared in this study to find out the efficacy in providing postoperative analgesia.

Method: 80 patients belonging to ASA 1 and 2 were divided into two groups of 40 each to receive intraperitoneal instillation of 25 ml of either 0.2% Ropivacaine (R) or 0.125% Levobupivacaine (B) with 0.3 mg of buprenorphine as adjuvant. Pulse rate, respiratory rate, blood pressure, oxygen saturation, the numerical rating scale for pain, time to the first analgesic request and the total analgesic requirement were assessed in the postoperative period.

Results: There was no significant difference in mean pulse rate, blood pressure, respiratory rate, oxygen saturation, pain scores, time to the first analgesic request and the total analgesic requirement between group R and group B with all p values more than 0.05.

Conclusion: The intraperitoneal instillation of Levobupivacaine and Ropivacaine with buprenorphine as the adjuvant is effective and have comparable postoperative analgesia after laparoscopic gynecological surgeries.

Keywords: Laparoscopic gynecological surgery, Intraperitoneal instillation, Levobupivacaine, Postoperative analgesia, Ropivacaine.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0) and the Budapest Open Access Initiative (http://www.budapestopenaccessinitiative.org/read), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Laparoscopic gynecological surgeries came into practice almost 50 years back and was initially confined to diagnostic procedures and sterilization but, using advanced techniques and instruments now it is widely being used for ovarian surgeries,

Laparoscopically-Assisted Vaginal Hysterectomy (LAVH) and Total Laparoscopic Hysterectomy (TLH) [1]. The surgical incision and the creation of pneumoperitoneum in laparoscopy cause intra-abdominal trauma leading to generation of pain. Nevertheless, the pain caused by the procedure is mild and short lasting than that of laparotomy, with significantly less morbidity and lesser cost than laparoscopic technique [2,3]. Further the benefits of laparoscopic surgery include the reduction in operative trauma, reduced hospital stay, better cosmetic results and good patient satisfaction.

Pain after laparoscopy usually occur in the abdomen, shoulder or back and may be transient or persistent for several days [4]. The main mechanism of pain generation in laparoscopy is by rapid distention of peritoneum, causing breakage of blood vessels, stretch of nerve fibers and release of inflammatory mediators [5]. Infiltration with local anaesthetics at the surgical site reduces the pain after laparoscopic gynecologic surgeries [5].

Levobupivacaine and ropivacaine are amino amide local anesthetic agents used for regional anaesthesia. In epidural and peripheral nerve blocks, equipotent doses of ropivacaine and levobupivacaine produces similar sensory blockade [6]. Levobupivacaine has been shown to be less cardiotoxic than bupivacaine in preclinical studies. Because of the lower cardiac and neurotoxicity, ropivacaine is used for surgical anaesthesia in concentrations up to 1%.

Even though there are many studies on the effect of levobupivacaine and ropivacaine in post-operative analgesia after laparoscopic surgeries, there are only few studies comparing levobupivacaine and ropivacaine with buprenorphine as the adjuvant in laparoscopic gynecological surgeries. Hence in this study we planned to assess the efficacy of these drugs for post operative analgesia in laparoscopic gynecological surgeries.

Aims and Objectives

To compare the efficacy of intraperitoneal instillation of 0.2% ropivacaine and 0.125% levobupivacaine with 0.3mg buprenorphine as adjuvant for postoperative analgesia in patients undergoing laparoscopic gynecological surgeries under general anaesthesia.

Objective

Primary objective:

To compare the efficacy of intraperitoneal instillation of 0.2% ropivacaine over 0.125% levobupivacaine with 0.3mg buprenorphine as adjuvant for postoperative analgesia in patients undergoing laparoscopic gynecological procedures under general anaesthesia.

Secondary objective:

To find out any side effects of drugs used.

Materials and Methods

It is a randomized comparative study done in patients undergoing elective laparoscopic gynecological surgeries at the Kerala Institute of Medical Sciences, Trivandrum, Kerala from September 2017 to February 2020 after getting an informed written consent from all the participants and institutional ethics committee approval. Sample size was calculated using the following formula from a previous study [7].

Required Sample size,

$$n = (s_1^2 + s_2^2)\ \frac{[z_{1-\alpha/2} + z_{1-\beta}]^2}{(\bar{x}_1 - \bar{x}_2)^2}$$

The desired confidence level

($Z_{1-\alpha/2}$) = 1.96

Power of the study ($1 - \beta$) = 80%

Mean of the variables $\bar{x}_1, \bar{x}_2$ = 3.08, 0.69

Patients receiving 0.125% levobupivacaine $\varkappa_1$= 3.08

Patients receiving 0.2% ropivacaine $\varkappa_2$ =0.69

Standard deviation of the variables S_1, S_2 = 5.12, 1.58

Therefore, the required sample size is: n = 40 patients in each group.

Accordingly, a total of 80 patients were required in the study.

Inclusion Criteria:

1. Patients belonging to American Society of Anaesthesiologists class I and II.
2. The age group of 18-70 years
3. Undergoing elective laparoscopic gynecological surgeries who stays in the hospital for at least 12 hours after surgery.

Exclusion Criteria:

1. History of previous abdominal surgery
2. The patients who require abdominal drain after surgery
3. Coagulopathies or systemic infections
4. Emergency surgeries.
5. The patients with known allergy to the drugs used in this study.
6. Postoperative complications.
7. The patients in which pain evaluation is unreliable because of neurological disease/psychiatric illness.
8. The patients already receiving steroids, NSAIDs or opioids before surgery.
9. Laparoscopic surgery converted to open surgery.

Methodology

After approval of the institutional ethical committee, 80 consenting patients for elective laparoscopic gynecological surgery were divided into two groups using a computer generated random number table. Group B**,** received 0.125% levobupivacaine 25 ml with 0.3mg buprenorphine intraperitoneally and Group R, received 0.2% ropivacaine 25ml with 0.3mg buprenorphine intraperitoneally. Inside operation theatre, the basic monitors including Electrocardiogram (ECG), Non-Invasive Blood Pressure (NIBP), Oxygen Saturation (SPO2) and Neuromuscular Junction monitor (NMJ) were attached.

Intravenous line was secured under local anesthesia and ringer lactate solution was initiated. Injection midazolam 1 mg and injection glycopyrrolate 0.2mg were given intravenously (iv). Analgesic of choice was injection fentanyl 2mcg/kg iv. Induction agent propofol was given as 1.5-2mg/kg iv boluses till the patient loses response to verbal commands. The maximum amplitude for the NMJ response was recorded and then injection atracurium 0.5mg/kg or injection vecuronium 0.08-0.1 mg/kg iv was given. Patient's airway was secured after no response to train of four stimuli with an appropriately sized cuffed endotracheal tube.

Maintenance of anesthesia was with oxygen, air, isoflurane/sevoflurane [concentration adjusted to maintain minimum alveolar concentration to 1-1.5]. Skeletal muscle relaxant atracurium or vecuronium, analgesia with fentanyl were repeated as per requirement. Opioids other than fentanyl like morphine/buprenorphine/pentazocine were avoided. Intraoperatively injection paracetamol 1gm was given as an intravenous infusion. Depending upon the patient group, the operating surgeon instilled the concerned local anesthetic solution intraperitoneally via trocars, after the completion of surgery. The neuromuscular block was reversed with neostigmine 0.05mg/kg with glycopyrrolate 0.01mg/kg iv and the trachea was extubated. In the postoperative period, patients were monitored at 0,1,2,3,4,6,8& 12 hours for Numerical Rating Scale scores (NRS) at rest

and deep breathing, sedation, pulse rate, respiratory rate, blood pressure, oxygen saturation and side effects like nausea, vomiting, pruritus etc.

If patient complaints of pain or NRS greater than 4 at rest or on deep breathing, Injection tramadol 2mg/kg was given as the first rescue analgesic. Time to the first request of the analgesic and the total amount of additional intravenous analgesics given were noted. Analgesia was assessed using the numerical rating scale for pain wherein 0 cm is no pain and 10 cm is the worst pain imaginable.

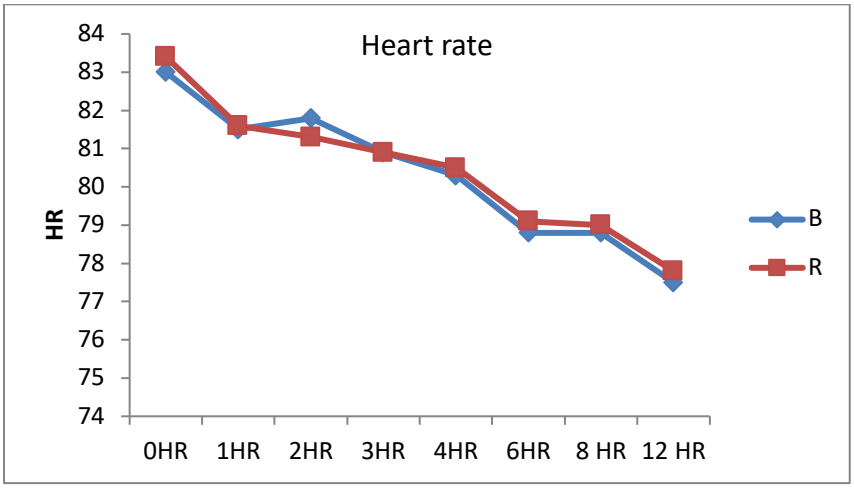
The Post Operative Nausea and Vomiting (PONV) was assessed using a scale where (0 = no PONV, 1 = only nausea treated with metoclopramide 10mg iv, 2 = mild vomiting treated with ondansetron 4mg iv, 3 = heavy vomiting requiring other treatments in addition to ondansetron like dexamethasone). Hypotension is considered as a drop in systolic blood pressure of more than 20% of preoperative value or less than 90 mmHg any time during the study period. The respiratory depression is defined as a respiratory rate of less than 8/min.

Statistical Method

All the data were analyzed using the Statistical package for Social Sciences (SPSS) version 16.0. Descriptive statistics were summarized using means and standard deviations (SDs) or medians with Inter Quartile Ranges (IQR) for continuous variables, and percentiles/rates for categorical variables. A p-value less than 0.05 was considered statistically significant. The comparison of the means between group B and group R were done using ANOVA test.

Results

The two groups were comparable with respect to ASA physical status, age, Body Mass Index and duration of surgery with all P values more than 0.05. Mean duration of surgeries in Group B was 2.55 hours and in Group R was 2.70 hours. There was no statistically significant difference in the mean heart rate or systolic blood pressure between these groups (Figure 1). There was no statistically significant difference in mean diastolic pressure (Table 1), respiratory rate, oxygen saturation and time to the first analgesic request with all p values more than 0.05.



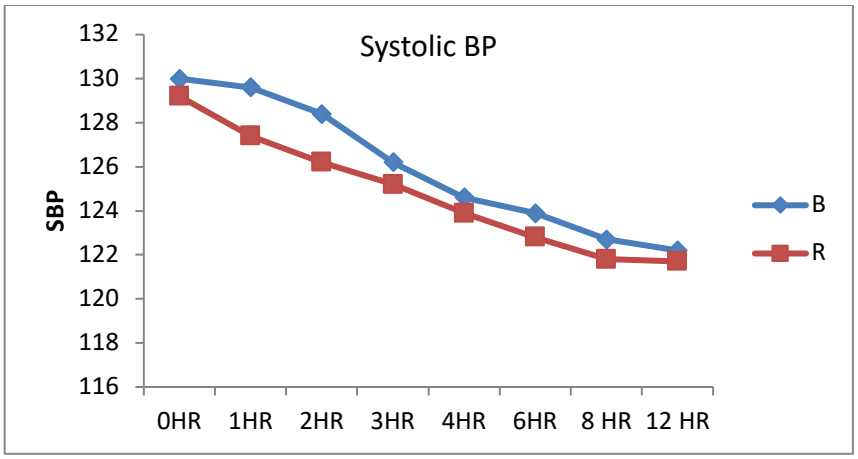


Figure 1: Comparison of heart rate and systolic blood pressure between two groups

Table 1: Mean diastolic blood pressure at various time intervals.

Diastolic BP	Group B		Group R,		t	p
	Mean	SD	Mean	SD,		
0HR	84.2	3.9	84.0	5.3	.181	.857
1HR	84.2	4.8	82.3	7.9	1.191	.238
2HR	82.7	4.9	81.5	7.3	.842	.403
3HR	81.4	5.1	81.7	6.3	-.162	.872
4HR	80.0	4.9	81.1	5.0	-.908	.367
6HR	79.4	4.5	79.8	5.3	-.288	.775
8 HR	78.5	4.5	79.4	5.3	-.748	.457
12 HR	78.1	4.7	79.7	5.5	-1.284	.204

The pain scores at various intervals are compared in figure2 and groups had comparable results. The total amount of analgesics given in the post-operative period were also comparable (0.21± 0.47, 0.15± 0.366).

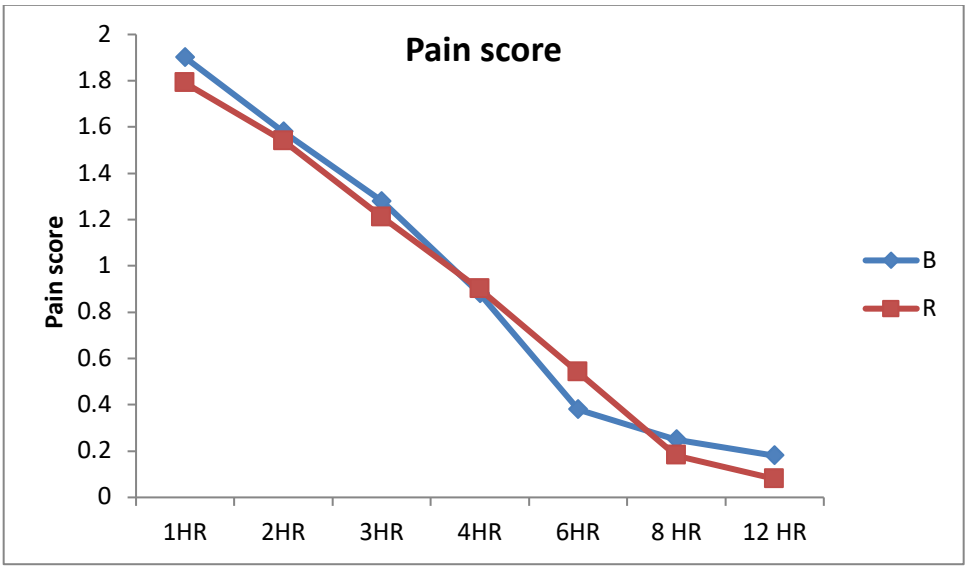


Figure 2: Pain score at various time intervals.

Discussion

Inadequate pain control after laparoscopic surgeries will lead to increased requirement of analgesics, prolonged hospitalization, reduced patient satisfaction and increased hospital expenses thus resulting in loss of advantage of laparoscopy as a minimally invasive surgery [7-9]. Many methods have been investigated for post operative analgesia after laparoscopic surgeries, including trocar site injection of local anaesthetics, intra-peritoneal instillation, transversus abdominis plane block and intravenous analgesia which are used to reduce the pain associated with laparoscopic surgery [10-12].

The patients in our study groups did not vary with respect to age and ASA physical status. The study groups were comparable with respect to the type and the duration of surgery. There were no significant differences in mean heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure between these groups perioperatively. In this study comparing the efficacy of Levobupivacaine and Ropivacaine, there was no significant difference in pain scores at different time intervals between these groups (p value >0.05). One previous study carried out by Goldstein *et al* [7] in gynecologic laparoscopy showed that the intra-peritoneal instillation of 20 mL of either 0.5% bupivacaine or 0.75% ropivacaine prevented postoperative pain and decreased the postoperative analgesic requirement when compared with placebo in patients undergoing laparoscopic gynecologic surgery.

According to Rivard C *et al*, the administration of intraperitoneal bupivacaine was associated with better postoperative pain relief in patients undergoing minimally invasive laparoscopic surgery[13]. The mean pain scores were lower on the day of surgery in the intraperitoneal bupivacaine group (2.7 vs 3.2, p =0.05). Similar results were observed in our study also where the mean pain score was lower 12hrs post operatively in both Levobupivacaine and Ropivacaine group (pain score after 12hr was 0.18±0.38 in group B, 08±0.27 in group R). Narchi *et al*. found that intraperitoneal instillation of local anesthetic was more effective in reducing the pain up to 48 h postoperatively in patients undergoing diagnostic laparoscopy [5]. Callesen *et al*. conducted a double-blind, randomized study on combined port site and mesosalpinx infiltration versus peritoneal instillation of 285 mg of ropivacaine in 80 patients undergoing laparoscopic tubal sterilization, have demonstrated similar efficacy between these techniques [14]. Intraperitoneal instillation has made a significant reduction in the postoperative pain experienced by the patients and has made it a nearly painless experience. In our study we found that the extent of pain relief by intraperitoneal instillation of ropivacaine is comparable to levobupivacaine with respect to the quality of analgesia and side effect profiles.

The main limitation of the study was that the pain threshold could be variable depending upon the patient's level of tolerance to pain. Hence the Numerical Rating Scale, which was used for assessing the pain in this study can be a variable factor.

References

1. Gibbison B, Kinsella SM. Postoperative analgesia for gynecological laparoscopy. Saudi J Anaesth. 2009; 3:70-6.
2. Barkun JS, Sampalls JS, Fried G, Wexler MJ, Meakins JL, Taylor B, *et al*. Randomised controlled trial of laparoscopic versus mini cholecystectomy. The Lancet. 1992; 340(8828):1116-9.
3. Stiff G, Rhodes M, Kelly A, Telford K, Armstrong CP, Rees BI. Long term pain:

less common after laparoscopic than open cholecystectomy. BJS. 1994; 81:1368-70.
4. Dobbs FF, Kumar V, Alexander JI, Hull MGR. Pain after laparoscopy related to posture and ring versus clip sterilization. BJOG. 1987; 94:262-6.
5. Narchi P, Benhamou D, Fernandez H. Intraperitoneal local anesthetic for shoulder pain after day case laparoscopy. Lancet. 1991; 338:1569–70.
6. Ohmura S, Kawada M, Ohta T. Systemic toxicity and resuscitation in bupivacaine, levobupivacaine, or ropivacaine-infused rats. Anest Analg. 2001; 93:743–8.
7. 7.Goldstein A, Grimault P, Henique A, Keller M, Fortin A, Darai E. Preventing postoperative pain by local anesthetic instillation after laparoscopic gynecologic surgery: A placebo-controlled comparison of Bupivacaine and ropivacaine. Anesthesia & Analgesia. 2000; 91(2):403–7.
8. Kum CK, Wong CW, Goh PM, Ti TK. Comparative study of pain level and analgesic requirement after laparoscopic and open cholecystectomy. Surgical laparoscopy and endoscopy. 1994; 4:139-41.
9. Tate JJ, Chung SC, Dawson J, Leong HT, Chan A, Lau WY, *et al*. Conventional versus laparoscopic surgery for acute appendicitis. BJS. 1993; 80:761-4.
10. Suseela I, Anandan K, Aravind A, Kaniyil S. Comparison of ultrasound-guided bilateral subcostal transversus abdominis plane block and port-site infiltration with bupivacaine in laparoscopic cholecystectomy. Indian J Anaesth. 2018 Jul; 62(7):497-501.
11. Rosenblum M, Weller RS, Conard P, Falvey EA, Gross JB. Ibuprofen provides longer lasting analgesia than fentanyl after laparoscopic surgery. Anesth Analg.1991; 73:255-9.
12. Ding Y, White PF. Comparative effects of ketorolac, dezocine, and fentanyl as adjuvants during outpatient anesthesia. Anesth Analg. 1992; 75:566-71.
13. Rivard C, Vogel RI, Teoh D. Effect of Intraperitoneal Bupivacaine on Postoperative Pain in the Gynecologic Oncology Patient. J Minim Invasive Gynecol. 2015;22(7):1260-5.
14. Callesen T, Hjort D, Mogensen T, Schouenborg L, Nielsen D, Reventlid H, *et al*. Combined field block and i.p. instillation of ropivacaine for pain management after laparoscopic sterilization. Br J Anaesth. 1999; 82:586-90.