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Randomised Clinical Trial on Effect of Adding Magnesium Sulphate with 0.75% Ropivacaine and Dexmedetomidine with 0.75% Ropivacaine in Patients Undergoing Elective Laparotomy in a tertiary care hospital

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Abstract

Background: Laparotomies requires a good amount of pain relief postoperatively to avoid delay in recovery and reduce the duration of stay in the hospital. Among multiple modalities of pain relief postoperative wound infiltration is simple, easy to administer and it has minimal systemic side effects. In our study, we are going to compare the efficacy of 5% magnesium sulfate with 1.5 µg/kg dexmedetomidine along with 0.75% ropivacaine. It's the effect on the postoperative opioid requirement. *Material and Methods*: 60 ASA I and II patients who are posted for elective laparotomies were randomized to receive one of two treatments: Group RM: 30 ml of drug (0.75% Ropivacaine 3 mg/kg with 5% Magnesium sulfate). Group RD: 30 ml of drug (0.75% Ropivacaine 3 mg/kg with 1.5 µg/kg Dexmedetomidine). Postoperative VAS scoring, time for first rescue analgesia, total tramadol requirement in first 24 hours, patient satisfaction and complications like nausea, vomiting, bradycardia, hypotension, respiratory depression were noted and expressed as mean and standard deviation. Data analyzed with SPSS software version 16.0. $p < 0.05$ considered statistically significant. *Results*: Time for first rescue analgesia was earlier in the RM group when compared to the RD group ($p>0.05$). the total dose of tramadol requirement significantly less with RD group 421.02 ± 21.2 when compared to RM group 221.08 ± 12.6 ($p<0.005$), sedation score (Grade 2 level sedation) and patient satisfaction scores were significantly higher with RD group ($p<0.05$). *Conclusion*: Results of our study concludes that 0.75% Ropivacaine with 1.5 µg/kg Dexmedetomidine provides better postoperative analgesia by reducing the dose of tramadol requirement with good sedation and excellent patient satisfaction than 0.75% Ropivacaine with 5% Magnesium Sulphate in patients undergoing elective laparotomies.

Keywords: Ropivacaine; Dexmedetomidine; Elective Laparotomy

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Introduction

Postoperative pain is the major concern after the major abdominal surgeries because it causes instability in hemodynamics, affects respiratory function, it may affect the easy recovery and it may prolong the hospital stay. At present we have multiple modalities of pain relief like Parenteral NSAIDs, opioids, epidural infusion, plexus blocks or field blocks or individual nerve blocks and lastly local surgical wound infiltration. Wound infiltration provides good analgesia with very minimal side effects [1]. Ropivacaine is the newer amide local anesthetic with less cardiotoxicity when compared to Bupivacaine. There are so many adjuvants which can enhance the duration

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of postoperative pain relief of local anesthetics. Among those, we have selected Dexmedetomidine and Magnesium sulfate [2]. Dexmedetomidine is the selective alpha 2 receptor agonist. It has been used as an adjuvant in spinal anesthesia, epidural and various nerve blocks. Dexmedetomidine also used in local wound infiltration along with Bupivacaine and Ropivacaine [3,4]. Magnesium sulfate is working as an analgesic by antagonizing NMDA receptor. It also used as an adjuvant with local anesthetics in epidural and spinal anesthesia. Studies on wound infiltration are very sparse. Along with reducing postoperative pain it also reduces the requirement of postoperative systemic analgesic requirement [5]. There are studies which assessed their analgesic properties along with Bupivacaine and Ropivacaine individually. As for as our knowledge, there is no study compared these two drugs along with ropivacaine in postoperative pain relief after infiltrating the surgical wound in patients undergoing elective laparotomy. So in our prospective randomized control study, we are going to compare the efficacy of dexmedetomidine and magnesium sulfate along with 0.75% ropivacaine in surgical wound infiltration.

Material and Methods

After getting clearance from our institutional ethical committee approval for the study, we have selected 60 ASA I and II patients in the age group of 18–50 of either sex who are posted for elective laparotomy under general anesthesia for our study. Before selecting the patients the procedure was clearly explained in their own language and we have got the written informed consent before performing the study. The study was conducted over a period of 6 months. The patients refusing to undergo study, patients with anticoagulant therapy, emergency surgeries, surgeries more than 2 hours duration, laparotomy which requires more than 1 blood transfusion, patients with allergy to any of the study drugs, patients with uncontrolled diabetes and hypertension, shock and patients with hemodynamic instability were excluded from the study. Once selected 60 patients divided into 2 groups. 60 patients undergoing elective laparotomies will be randomized to receive one of two treatments: Group RM: 30 ml of drug (0.75% Ropivacaine 3 mg/kg with 5% Magnesium sulfate). Group RD: 30 ml of drug (0.75% Ropivacaine 3 mg/kg with 1.5 mcg/kg Dexmedetomidine). We have assigned the group based on block randomization. The double-blind technique was followed. The person who prepared the drug solution and the one who has given the solution were different and the person who has collected the data was another anesthesiologist. Once patients assigned to the group, on previous night they were given Tab Pantoprazole 40 mg and Tab Alprazolam 0.5 mg. After 8 hours of nil by mouth, patients shifted to the preoperative room. There they were started on 18G iv cannula on the left forearm and intravenous fluid Lactated Ringers solution started at the rate of 100 ml per hour. Their vitals checked and Inj Glycopyrrolate 0.2 mg, Inj Pantoprazole 40 mg, Inj Midazolam 1 mg and Inj Ondansetron 4 mg given intravenously before shifting the patient to the operating room. Once the patient shifted inside the OR all patients connected with SpO_2, ECG, NIBP was attached. Pressure points were padded. Inj fentanyl 2 μg/kg given for analgesia. Preoxygenation with 100% O_2 for 3 minutes. Induced with Inj Propofol 2 mg/kg once induced intubated with Inj Vecuronium 0.1 mg/kg. After checking the air entry endotracheal tube was secured with dynaplast. Ventilation was started with GE mechanical ventilator in VCV mode. After intubation surgeons allowed to put Foley's catheter to monitor urine output. $ETCO_2$ was attached. Anesthesia was maintained with 1 MAC isoflurane (Penlon), oxygen and nitrous oxide. Inj Vecuronium 0.01 mg/kg was given every 30 minutes. Intraoperatively vitals were noted every 30 minutes. At the end of the surgery before skin closure prepared drug solution either RM or RD 30 ml was infiltrated as per their allotted group by operating surgeon who was unaware of the study groups. After skin closure and final dressing, patients reversed with 0.05 mg/kg Inj Neostigmine and 0.02 mg/kg Inj Glycopyrrolate and extubated once fully recovered from anesthesia. Immediately after extubation was considered hour zero and their vitals and level of pain (based on Visual Analogue Scoring) was noted [6]. VAS scoring (0 means no pain, 10 means worst pain) used to assess the pain on hour 0, 30 mins then every hourly till 6 hours postoperatively then 9 hours, 12 hours and 24 hours postoperatively. Herat rate and MAP recorded at the same intervals. Inj Tramadol 2 mg/kg was given as rescue analgesia if the patient complained of pain VAS > 4. The first analgesic requirement, the total analgesic requirement in first 24 hours, complications like nausea, vomiting, sedation (Ramsay Sedation Scale) [7], bradycardia (HR<60), hypotension (more than 20% fall than baseline BP) and respiratory depression were noted. Patient satisfaction score based on analgesia quality was measured and compared between RM and RD groups [8] at the end of 24 hours. (1 – excellent relief, 2- good, 3- satisfactory, 4- poor and 5- very

poor) Bradycardia was treated with Inj Atropine 0.02 mg/kg. hypotension was treated with Inj Ephedrine 5 mg bolus. Vomiting treated with Inj Ondansetron 4 mg.

Statistical Analysis

Based on the previous study [9] by Sandeep Kundra et al. 2016 sample size calculated was 20 per group. To avoid any loss of cases or any defaulter 30 patients were selected for each group at a 95% level of significance and power of the study was 90%. p-value of < 0.05 considered statistically significant. Data were expressed as mean and standard deviation. Mann-Whitney test, Chi-square test, and Student t-test were used to analyze the data.

Results

Table 1: Shows the Demographic Data of Patients

Characteristics	Group RM	Group RD	p-value
Age (years)	36.35 ± 42	37.21 ± 68	0.678
Sex (M/F)	16/14	13/17	0.641
Height (cm)	150.72 ± 4.11	152.2 ± 3.21	0.786
Weight (kg)	55.42 ± 4.43	56.31 ± 4.33	0.687
Duration of surgery(hrs)	1.2 ± 0.21	1.1 ± 0.12	0.523

Both RM and RD groups were compared based on Age, Sex, Height, Weight and surgical procedure duration (Table 1). (p>0.05)

Table 2: Rescue Analgesic Characteristics (VAS >4)

Analgesic requirements	Group RM	Group RD	p-value
Time for first rescue analgesia (hours)	5.02 ± 0.35	6.92 ± 0.45	0.168
Total dose of tramadol required (mg)	421.02 ± 21.2	221.08 ± 12.6	<0.005

Time for the first rescue analgesia was earlier in RM group than RD. but the difference was not statistically significant (p>0.05). The total dosage of tramadol required in 24 hours was significantly high in the RM group than RD group (421.02 ± 21.2 vs 221.08 ± 12.6) (p < 0.005). (Table 2)

Table 3: Ramsay Sedation Scale Comparison

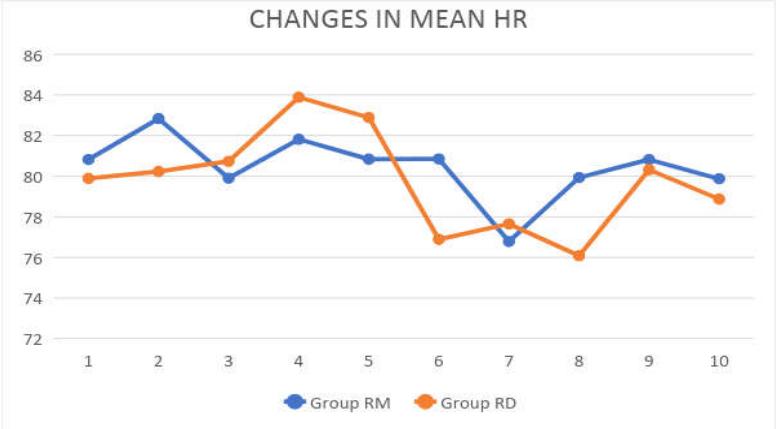
Scale	Group RM	Group RD	p-value
1	28(93.3%)	20(66.7%)	0.654
2	2(6.7%)	9(30%)	<0.05
3	0	1(3.3%)	-
4	0	0	-
5	0	0	-
6	0	0	-

30% of the patients in group RD had grade 2 level of sleep when compared to RM group (6.7%). Which was statistically significant (p < 0.05). (Table 3)

Table 4: Patient Satisfactory Score

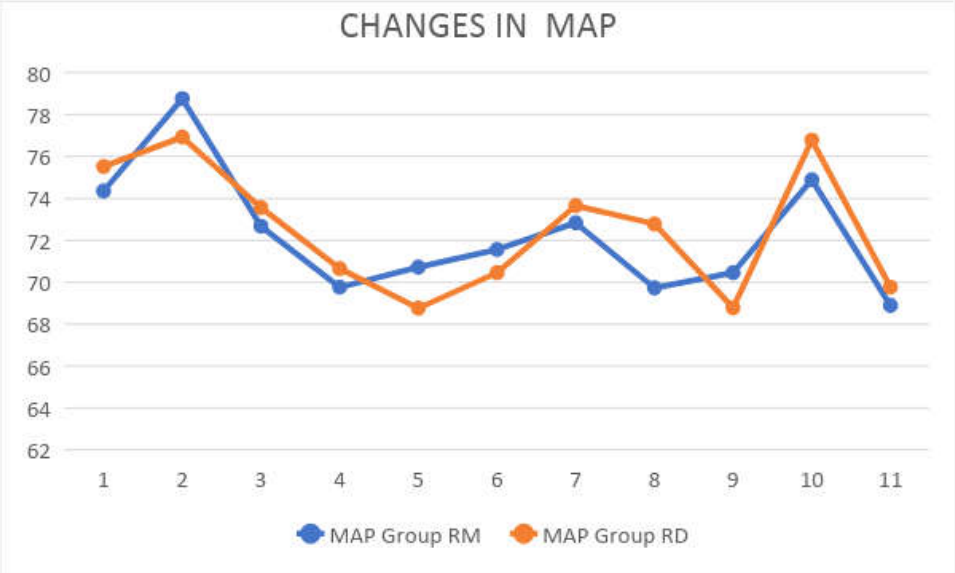
Score	Group RM	Group RD	p-value
1	10 (33.3%)	21 (70%)	<0.005
2	16 (53.3%)	9 (30%)	0.147
3	4 (13.3%)	0	-
4	0	0	-
5	0	0	-

Quality of postoperative analgesia was statistically significant in the RD group (70% vs 33.3%) (p<0.005) (Table 4)



Graph 1: Changes in Mean Heart Rate

Heart rate and MAP were comparable between the two groups (Graph 1 and 2). (p>0.05).



Graph 2: Changes in Mean Arterial Pulse

Table 5: Complications

Complications	Group RM	Group RD	p-value
Nausea, vomiting	4	3	0.786
Bradycardia	1	2	0.621
Hypotension	2	2	0.732
Respiratory depression	0	0	-

There was no significant difference in complications like nausea, vomiting, bradycardia, hypotension and respiratory depression (p>0.05). (Table 5)

Discussion

Postoperative pain is a major concern after major laparotomies since it affects early recovery and early discharge from the hospital. There are multiple modalities of postoperative pain relief that includes epidural infusion, NSAIDs, opioids. Another method of pain relief is intralesional local anesthetic infiltration. To increase the duration of action of local anesthetics there are so many adjuvants can be used. They are clonidine, dexmedetomidine, tramadol, ketamine, magnesium [9]. In our study, we have chosen Ropivacaine because Bupivacaine has a risk of cardiotoxicity and based on a study conducted by Ayman et al. [10] 0.75% Ropivacaine provided better analgesia than 0.5% Bupivacaine in patients undergoing thyroidectomy. Studies used 0.1%, 0.2% [11], 0.375% [12] and 0.5% found that these concentrations were ineffective in postoperative pain relief. Injecting local anesthetics into the wound blocks afferent transmission of pain impulse from the wound surface, it also acts as an anti-inflammatory to reduce pain and edema on the wound [13]. The dose of dexmedetomidine and magnesium sulfate were taken from previous studies since there were no previous comparative studies [14]. Analgesic action of dexmedetomidine is mediated by noradrenaline release and alpha 2 receptor-independent action potential inhibition. Infiltrating dexmedetomidine provides analgesia and it avoids bradycardia and hypotension when injected intravenously [15]. Magnesium sulfate provides analgesia by blocking NMDA receptor antagonism. The dose of first rescue analgesia was earlier in magnesium sulfate group when compared to Dexmedetomidine and Ropivacaine group, our results were compared with a study conducted by Shaman Bhardwaj et al. [4] and Kim BG et al. [16]. They found that time for first rescue analgesia was more in patients received Dexmedetomidine and Ropivacaine than plain Ropivacaine group. They have studied the effects on patients undergoing LSCS and hemorrhoidectomy respectively. Time of first rescue analgesia in our study was comparable to the study conducted by Sandeep Kundra et al. [9], time to require rescue analgesia in the RM group was 5.02 ± 0.35 vs 6.00 ± 3.51 hours. It may be because of the dose of magnesium was 750 mg compared to 500 mg which was used in our study. This difference between RM and RG group was statistically not significant. The total dose of Inj Tramadol requirement was significantly higher in Magnesium group when compared to the Dexmedetomidine group (p<0.005). Dexmedetomidine group patients had a significant level of Grade 2 sedation compared to Magnesium group (9 vs 2 patients). 1 patient in the Dexmedetomidine group had

grade 3 level sedation. This level of sedation was like study conducted by Abdel Ghaffer et al. [17] they have used it in tonsillectomy local and intravenous dexmedetomidine. 70% of patients had excellent pain relief with Dexmedetomidine and Ropivacaine. No significant differences in nausea, vomiting, bradycardia, and hypotension in either group. No patients developed respiratory depression.

Conclusion

Results of our study concluded that 0.75% Ropivacaine with 1.5 µg/kg Dexmedetomidine provides better postoperative analgesia by reducing the dose of tramadol requirement with good sedation and excellent patient satisfaction than 0.75% Ropivacaine with 5% Magnesium Sulphate in patients undergoing elective laparotomies.

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Conflict of Interest: None

References

1. Jyothi B, Govindaraj K, Pratishruthi, Shaikh SI. Comparison of analgesic efficacy of levobupivacaine, levobupivacaine, and clonidine, and levobupivacaine and dexmedetomidine in wound infiltration technique for abdominal surgeries: A prospective randomized controlled study. Indian J Pain. 2017;31:127-32.
2. Simpson D, Curran MP, Oldfield V, Keating GM. Ropivacaine: a review of its use in regional anesthesia and acute pain management. Drugs. 2005;65(18):2675-717.
3. Singh S, Prasad C. Postoperative analgesic effects of dexmedetomidine administration in wound infiltration for abdominal hysterectomy. A randomized control study. Indian J Anaesth. 2017;61:494-8.
4. Shaman Bhardwaj, Sumeet Devgan, Dinesh Sood, Sunil Katyal. Comparison of local wound infiltration with ropivacaine alone or ropivacaine plus dexmedetomidine for postoperative pain relief after lower segment cesarean section. Anesth Essays res. 2017;11(4):940-945.
5. Ahmad A. Eldaba, Yasser M. Amr, Reda A. Sobhy. Effect of wound infiltration with bupivacaine or lower dose bupivacaine/magnesium versus placebo for postoperative analgesia after cesarean section. Anesth Essays Res. 2013;7:336-40.
6. Mallika data, Suman Chattopadhyay. Efficacy of wound infiltration with ropivacaine, lornoxicam or their combination in total abdominal hysterectomy. Indian journal of pharmacy and pharmacology. 2017;4(1):34-37.
7. Ramsay MA, Savage TM, Simpson BR, Goodwin R. Controlled sedation with alphaxalone-alphadolone. Br Med J. 1974;2:656-9.
8. Webb AR, Leong S, Myles PS, Burn SJ. The addition of a tramadol infusion to morphine patient-controlled analgesia after abdominal surgery: A double-blinded, placebo-controlled randomized trial. Anesth Analg. 2002;95:1713-8
9. Sandeep Kundra, Rupinder M Singh, Tania Singh, Vikrant Jarewal, Sunil Katyal. Efficacy of Magnesium sulfate as an adjunct to Ropivacaine in local infiltration for postoperative pain following lower segment cesarean section. Journal of Clinical and Diagnostic research. 2016;10(4):18-22.
10. Ayman M, Materazzi G, Bericotti M, Rago R, Nidal Y, Miccoli P. bupivacaine 0.5% versus Ropivacaine 0.75% wound infiltration to decrease postoperative pain in total thyroidectomy, a prospective controlled study. Minerva Chir. 2012;67(6):511-6.
11. Edna Zohar, Arie Shapiro, Alex Phillipov, David Hoppenstein, Zvi Klein, Brian Fredman. The postoperative analgesic efficacy of wound infiltration with ropivacaine 0.1% versus 0.2%. J Clin Anaesth. 2004;16(6):399-404.
12. Anders Johansson, Jonas Kornfalt, Lena Nordin, Lena Svensson, Christian Ingvar, John Lundberg. Wound infiltration with Ropivacaine and fentanyl: effects on postoperative pain and PONV after breast surgery. J.Clin. Anesth. 2003 Mar;15:113-118.
13. Hollmann MW, Durieux ME. Local anesthetics and the inflammatory response: a new therapeutic indication? Anesthesiology. 2000;93:858-75.
14. Cheung CW, Ng KF, Choi WS, Chiu WK, Ying CL, Irwin MG. evaluation of analgesic efficacy of local dexmedetomidine application. Clin J Pain. 2011; 27:377-82.
15. Grewal A. Dexmedetomidine: New avenues. J Anaesthesiol Clin Pharmacol. 2011;27:297-302.
16. Kim BG, Kang H. the effect of preemptive perianal ropivacaine and ropivacaine with dexmedetomidine on pain after hemorrhoidectomy: A prospective, randomized, double-blind, placebo control study. Indian J Surg. 2014;76:49-55.
17. Abdel-Ghaffar HS, Abdel-Haleem AK. Efficacy and safety of intraoperative dexmedetomidine in pediatric posttonsillectomy pain. Peritonsillar versus intravenous administration. World Pumps 2011 Oct;27(4):219-25.

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