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Efficacy of 8 mg of Dexamethasone as an Adjuvant to 0.2% Ropivacaine in USG Guided Pre-Emptive Caudal Epidural Block in Patients Undergoing Lumbar Spine Surgeries

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ABSTRACT

High degree of post-operative pain in adult patients undergoing lumbosacral spine surgeries is a significant cause of morbidity, extended length of facility stays and marked opioid usage. Since, these patients typically have pre-existing chronic low back ache, adequate pain relief is important to help early recovery and improve functional outcome. Dexamethasone has been successfully used as an effective analgesic in a number of studies. Ropivacaine has a better safety profile compared with other local anaesthetics in terms of cardiovascular and CNS toxicity which makes it ideal drug for lumbosacral spine surgeries. The study was conducted in the Department of Anaesthesiology, Vydehi Institute of Medical Sciences and Research Centre, Bangalore from March 2020 to August 2021. The sample size taken for this study was 50 patients fulfilling the inclusion criteria, further divided into two groups of 25. Group A received 0.2% Ropivacaine and Group B received 0.2% Ropivacaine + 8mg Dexamethasone. Patient were monitored for vitals every 10 min for 1 hrs, every 15 min for next 1 hrs. Data was analysed and recorded. The mean of age group was recorded as 50.96±9.48 (years). The mean of opioid consumption was recorded as 116.00±22.36 mcg with the range between minimum 80 mcg and maximum 180 mcg, whereas in group B the mean of opioid consumption was recorded as 144.00±22.77 mcg with the range between minimum 100 mcg and maximum 200 mcg. Dexamethasone when used as an adjuvant with ropivacaine, provides effective acute pain control after surgery, decreases opioid consumption with no complications.

INTRODUCTION

High degree of post-operative pain in adult patients undergoing lumbosacral spine surgeries is a significant cause of morbidity, extended length of facility stays and marked opioid usage. These patients typically have pre-existing chronic low back aches that would have been treated with conventional analgesics and narcotic and hence complicating pain management. Therefore, adequate pain relief is important to help early recovery and improve functional outcome. Pre-emptive analgesia prevents establishment of altered processing of afferent input which amplifies post -operative pain. With this concept we advocated the use of regional blocks in addition to general anaesthesia and prevent intraoperative nociception and formation of changes in the central nervous system during surgery[1]. Several studies have shown that caudal epidural injections are relatively safe, simple and effective in relieving postoperative pain. Local anaesthetics are absorbed by the nerve roots in about 20 min and prevent the perception of nociceptive stimuli. Following surgery, the first 24 hrs can be satisfactory in terms of pain relief and preventing central nervous system plasticity[2]. Few drugs that are most commonly administered along with local anesthetics include Fentanyl, Morphine, Pethidine, Tramadol, Clonidine, Dexmedetomidine, Butorphanol, Buprenorphine. Similarly Dexamethasone was also studied as an adjuvant to Ropivacaine as the search for the optimal adjuvants continues[3]. Dexamethasone is a glucocorticoid that has strong anti-inflammatory effects and is associated with membranes that may play a secondary role in dexamethasone's action on nociceptive C fibers. Dexamethasone has been successfully used as an effective analgesic in a number of studies. In addition to being a new amino-amide local anesthetic, Ropivacaine delivers long- acting relief[4]. In previous studies, Ropivacaine was found to produce sensory blockade of similar duration to Bupivacaine at equivalent doses. In addition, ropivacaine has a better safety profile compared with other local anaesthetics in terms of cardiovascular and CNS toxicity. This makes Ropivacaine an ideal drug for lumbosacral spine surgeries as it will not interfere with the surgeon's assessment of the motor system in the immediate postoperative period and decreases post-operative pain leading to early mobilization.

The effectiveness of Dexamethasone with Ropivacaine in comparison with Ropivacaine for perioperative analgesia following lumbosacral surgeries has not yet been established in the literature. The above study was carried out to compare Ropivacaine with Dexamethasone to Ropivacaine in adult lumbar spine surgeries using ultrasound guided caudal epidural blocks to determine which is more effective.

MATERIALS AND METHODS

Study place: The study was conducted in the Department of Anaesthesiology, Vydehi Institute of Medical Sciences and Research Centre, Bangalore from March 2020 to August 2021.

Study design: Comparative double blinded randomised clinical study.

Inclusion criteria: Patients of either sex, aged 18-65 years, posted for elective lumbo sacral spine surgery, belonging to (ASA) physical status I, II and ready to give informed consent.

Exclusion criteria: Patients who underwent previous lumbar spine surgery, contraindication to regional anaesthesia, patients with known cardiac, renal, hepatic, neurological disorders that would interfere with cardiovascular response assessment, spine abnormalities and body dysmorphism, unwilling to give written informed consent.

Sample size: 50 patients which were randomised into two groups of 25 each by using envelope method. Group A received 0.2% Ropivacaine and Group B received 0.2% Ropivacaine + 8mg Dexamethasone.

Data analysis: Data was analysed and entered in MS Excel and analysed in SPSS 22. Continuous variables were presented as percentage.

Ethical considerations: All the necessary ethical permissions were obtained from the Institutional Ethics Committee before beginning of the study. A thorough pre-anesthetic evaluation was done for all patients considered for surgery. Visual Analogue Scale (VAS, 0 = No Pain, 10 = Worst imaginable pain) for post-operative pain assessment and scoring system for nausea (0 =none, 1 = mild, 2 = moderate, 3 = severe) for post-operative nausea and vomiting assessment was explained to the patient pre-operatively, during pre-anaesthetic evaluation visit. Any patient failing to comprehend these scoring systems was excluded from the study. General anaesthesia for lumbar spine surgery, in both the groups followed the same standard technique. Pre medication with Inj. Glycopyrrolate bromide 0.005 mg kg^{-1} IV, Inj. Midazolam 0.02 mg kg^{-1} IV, Inj. Ondansetron 0.1 mg kg^{-1} IV. Pre oxygenation with 100% oxygen followed by Induction by Inj. Propofol 2-2.5mg kg^{-1} IV, Inj. Fentanyl Citrate 2 mcg kg^{-1} IV. Inj. Atracurium Besylate 0.5 mg kg^{-1} IV shall be given for neuromuscular blockade. Adequate depth of anaesthesia was maintained with 40% Oxygen in air, sevoflurane, infusion of Inj. Atarcurium Besylate 0.1 mg kg^{-1} IV and Inj. Fentanyl citrate as required. The sacral hiatus was visualised longitudinally and a

20 gauge (0.9 × 90 mm) spinal needle was inserted under sonographic guidance through the sacro-coccygeal ligament into the epidural space of the sacral canal. Slow injection of about 2 mL of air was used as a final check of correct needle placement.

Group A: patients received 20 mL of 0.2% Ropivacaine.

Group B: patients received 20 mL of 0.2% Ropivacaine + 8 mg Dexamethasone. Completion of injection was considered as time 0 (T0). Patient were assessed hourly for first 6 hours and at 9, 12, 18, 24 and 48 hrs post block and for Total opioid consumption intra-operatively and Post-operative, presence and severity of Pain using VAS (during rest and on deep inspiration). Vitals (HR, RR, NIBP and SpO2) were monitored in the post-operative period in the recovery room.

RESULTS

Mean differences of Age and Duration of Surgery were analyzed and shown in the Table 1-5. In group I, the mean of age group was recorded as 50.96 ± 9.48 with the range between minimum 35 and maximum 69, whereas in group II, mean of age group was recorded as 46.04±10.85 with the range between minimum 22 and maximum 65.

In group A, the mean of opioid consumption was recorded as 116.00±22.36 with the range between minimum 80 and maximum 180, whereas in group B the mean of opioid consumption was recorded as 144.00±22.77 with the range between minimum 100 and maximum 200. Moreover, the T value of the age in two groups was-4.386 and p>0.0001 revealed that there is a significance differences between groups.

Out of 2 (4%) in the 0 count, the group A has 2 (8%) and group B has none. Out of 5 (10%) in the 1 count the group A has 5 (10%) and group B has none. Out of 16 (32%) in the 2 count the group A has 12 (48%) and group B has 4 (16%). Out of 20 (16%) in the 3 count the group A has 4 (16%) but group B has 16 (64%). Out of 3 (6%) in the 4 count, the group A has 2 (8%) but group B has 1 (4%). Out of 4 (10%) in the 5 count the group A has no one but group B has 4 (16%).

Out of 2 (4%) in the 1 count the group A has 2 (8%) and group B has no one. Out of 24 (48%) in the 2 count the group A has 16 (64%) and group B has 8 (32%). Out of 20 (40%) in the 3 count the group A has 4 (16%) and group B has 16 (64%). Out of 1 (4%) in the 4 count the group A has 3 (12%) but group B has 1 (4%).

In group A (N = 25) the mean of First Rescue Analgesia was recorded as 10.91±0.56 with minimum value of 9.67 and maximum value of 11.83. Mean of group B (N = 25), was noted as 9.32±0.27 with minimum value of 8.83 and maximum value of 9.92. T-value of 12.712 reveals that there is high significant difference between the mean of two groups where the p-value was recorded as 0.0001. Meanwhile, in group A (N = 10) the mean of second Rescue Analgesia was recorded as 45.00±2.58 with minimum value of 40 and maximum value of 48. Mean of group B was noted as 25.78±3.63 with minimum value of 22 and maximum value of 37. T-value of 14.718 reveals that there is high significant difference between the mean of two groups where the p-value was recorded as 0.0001.

DISCUSSIONS

In the above study, age between the two groups were comparable. In group A, the mean of age group was recorded as 50.96±9.48 (years) with the range between minimum 35 year and maximum 69 years, whereas in group B, mean of age group was recorded as 46.04±10.85 (years) with the range between minimum 22 years and maximum 65 years. Additionally p-value 0.790 revealed that differences between the two groups were insignificant. Hence, the two groups were comparable in the aspect of age. Gender distribution was analyzed and out of the 50 patients included in the study, 16 patients (32%) were males and 34 patients (68%) were females. The demographic parameters in terms of age, gender ratio, and the surgical characteristics like the mean duration of surgery, type of surgery are all comparable among the two groups. In a study by Cummings *et al.*[5] the mean age was 55 years in the Ropivacaine group and 59 in the Dexamethasone group.

In a study by Karthika *et al.*[6] age incidences between three groups were comparable. Most of the patient's age in both the groups ranged between 35-45yrs. The mean ± standard deviation, age in 0.5% Ropivacaine (25 mL) with Dexamethasone 8 mg was 39.65+15.4 years and 0.5% Ropivacaine (25 mL) was 38.65±12.81 years which was comparatively lesser than our study.

The mean differences in Opioid consumption (fentanyl) by patients in the study was analyzed and in group A, the mean of opioid consumption was recorded as 116.00±22.36 mcg with the range between minimum 80 mcg and maximum 180 mcg, whereas in group B the mean of opioid consumption was recorded as 144.00±22.77 mcg with the range between minimum 100 mcg and maximum 200mcg. Moreover, the T-value of the age in two groups was-4.386 and p-value 0.0001 revealed that there is a significant difference between groups. Oliveira *et al.*[7] found that the opioid consumption was reduced in the perineural dexamethasone group as compared to control. Akkaya *et al.*[8] also found that total opioid consumption requirement was higher in the dexamethasone free group (92.9±36 mg) than the dexamethasone group (50.0±35 mg), (p = 0.001). In addition the longer analgesic duration was accompanied by a lower consumption of postoperative opioids.

Mean VAS scores were lower at 12, and 24 hours in Group A compared to Group B. p= 0.001, 0.044. In

Table 1: Distribution of age and duration of surgery of the studied group

Variable	Group	Mean±SD	Min (years)	Max (years)	p-value
Age	A	50.96±9.48	35.00	69.00	0.056
	B	46.04±10.85	22.00	65.00	
Duration of surgery	A	174.00±26.96	130.00	240.00	0.003
	B	171.20±25.54	140.00	250.00	

Table 2: Mean comparison of opioid consumption of the studied groups

Variable	Group	No	Mean±SD	Min (mcg)	Max (mcg)	T-value	p-value
Opioid Consumption	A	25	116.00±22.36	80.00	180.00	-4.386	0.0001
	B	25	144.00±22.77	100.00	200.00		

Table 3: VAS at 12 hrs

	Group		
VAS inspiration 12hrs	Group A	Group B	Total
.00 Count	2	0	2
% within group	8.0%	0.0%	4.0%
1.00 count	5	0	5
% Within group	20.0%	0.0%	10.0%
2.00 Count	12	4	16
% within group	48.0%	16.%	32.%
3.00 count	4	16	20
% within group	16.0%	64.0%	40.0%
4.00 count	2	1	3
% within Group	8.0%	4.0%	6.0%
5.00 count	0	4	4
% within Group	0.0%	16.0%	8.0%
Count	25	25	50
Total	100.0%	100.0%	100.0%

Table 4. VAS at 24 hours

	Group		
VAS inspiration 12hrs 1.00	Group A	Group B	Total
Count	2	0	2
% within Group	8.0%	0.0%	4.0%
2.00 Count	16	8	24
% within Group	64.0%	32.0%	48.0%
3.00 Count	4	16	20
% within Group	16.0%	64.0%	40.0%
4.00 Count	3	1	4
% within Group	12.0%	4.0%	8.0%
Total			
Count	25	25	50
% within Group	100.0%	100.0%	100.0%

Table: 5 First and second rescue analgesia of the studied groups

Variable	Group	No	Mean±SD	Min (hrs)	Max (hrs)	p-value
First rescue analgesia	A	25	10.91±0.56	9.67	11.83	12.712
	0.0001					
	B	25	9.32±0.27	8.83	9.92	
Second rescue analgesia	A	10	45.00±2.58	40.00	48.00	14.718
	0.0001					
	B	18	25.78±3.63	22.00	37.00	

Saraswathi Nagappa study[9] VAS score followed a decreasing trend from 0 to 240 min post-operatively, the VAS score was stable and this period was almost totally pain-free. After 240 min (4 hrs) the VAS score showed an increasing trend. They reported post-operatively, pain score assessed using VAS score in Group Ropivacaine 0.2% 20 ml with adjuvant had lower pain scores, which was statistically significant and the requirement of rescue medicine was lesser in Group ropivacaine + adjuvant. Kakiuchi *et al.*[10] concluded that pre-incisional caudal injection of bupivacaine and buprenorphine relieves postoperative wound pain on the lumbar spine performed under general anaesthesia. Deeksha Bindal *et al.*[11] noted that, the median VAS scores of Groups BD and RD were statistically lower than median VAS score of Groups B and R, respectively, at 5th , 6th, 20th and 24th hrs postoperatively (p<0.0001).

The mean comparison of first and Second Rescue Analgesia of the studied group was studied. In group A (N = 25) the mean of First Rescue Analgesia was recorded as 10.91±0.56 hrs with minimum value of 9.67 hrs and maximum value of 11.83 hrs. Mean of group B (N = 25), was noted as 9.32±0.27 hour with minimum value of 8.83 hrs and maximum value of 9.92 hrs. T-value of 12.712 reveals that there is a significant difference between the mean of two groups where the p-value was recorded as 0.0001. Meanwhile, in group A (N = 10) the mean of second rescue Analgesia was recorded as 45.00±2.58 hrs with minimum value of 40 hrs and maximum value of 48 hrs. Mean of group B was noted as 25.78±3.63 hrs with minimum value of 22 hrs and maximum value of 37 hrs. The T-value of 14.718 reveals that there is a significant difference between the mean of two groups where the p-value was recorded as 0.0001. These

values were statistically very significant. We infer that patients receiving Ropivacaine only required rescue analgesic earlier and in larger quantities whereas those receiving Ropivacaine with Dexamethasone were much later and lesser.

In a study by Cummings in 2011[5] the mean number of rescue analgesic dose was also lesser in Dexamethasone group than other two groups, which is in favour of this study. In a study by Akkaya[12], it was observed similarly that time to request additional analgesics was significantly higher in Dexamethasone with Levobupivacaine group than Levobupivacaine only group (13±7.8 hrs vs. 6.1±4.8 hrs, p-value 0.001) when Dexamethasone was added to Levobupivacaine in ultrasound guided TAP block. A study by Shrestha[13] found that the addition of 4-8 mg of Dexamethasone to LA in brachial plexus blocks reduced the onset of time and significantly prolonged the duration of analgesia with respect to rescue analgesia.

CONCLUSION

Dexamethasone when used as an adjuvant with ropivacaine, provides effective acute pain control after surgery, decreases opioid consumption with no complications. Pre-emptive caudal block with 0.2% Ropivacaine and 8 mg Dexamethasone provides longer and better analgesia for lumbosacral spine surgeries.

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