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## Comparison of dexamethasone and dexmedetomidine as adjuvant to 0.375% ropivacaine in erector spinae plane block for lumbar spine surgery: A randomized, double blind, placebo control trial

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### Abstract

**Background:** (ESPB) Erector spinae plane block is an interfascial plane block that effectively bonds a local anesthetic deep into the erector spinae muscle that lies contiguous to transverse processes. The present study was conducted to assess the outcome of dexmedetomidine and dexamethasone as an adjuvant for the erector spinae plane block (ESPB) to control postoperative pain after lumbar spine surgery.

**Materials and Methods:** 60 patients selected for undergoing lumbar spine surgery were grouped into 3 groups of 20 each. Group I patients received 0.375% ropivacaine 20 mL group II patients received 0.375% ropivacaine 20 mL with 8 mg dexamethasone and group III patients received 0.375% ropivacaine 20 mL with 1 µg/kg dexmedetomidine deep to the erector spinae muscle. Postoperative tramadol consumption, amount of rescue analgesia use, post-surgical hospital stay and (PONV) postoperative nausea and vomiting were noted.

**Results:** The demographic data and intraoperative opioid requirement was comparable in all groups. Postoperative tramadol consumption and rescue analgesic need was significantly less in group III as compared to group II and I. Postoperative stay in hospital was 6.1 days in 6.2 days in group II and 4.6 days in group III and the difference was significant.

**Conclusion:** Dexmedetomidine is found to be better than dexamethasone as an adjuvant to ropivacaine in erector spinae plane block in lumbar spine surgery.

**Keywords:** Dexmedetomidine, dexamethasone, erector spinae plane block, lumbar spine surgery

### Introduction

Erector spinae plane block is an interfascial plane block that effectively deposits a local anesthetic deep into the erector spinae muscle that lies contiguous to transverse processes <sup>[1]</sup>. Developing research established that ESPB can be engaged as a safe and simple alternative analgesic technique to address acute post-surgical, post-traumatic, and chronic neuropathic thoracic pain in children and adults. Fortuitously, its effectiveness to improve incisional pain has already been established in numerous clinical studies <sup>[2]</sup>.

Dexmedetomidine is a strong  $\alpha_2$  agonist and is presently evolving as an adjuvant to analgesia and regional anesthesia. It may extend the duration of the nerve block anesthesia when used with a local anesthetic and only has a limited adverse effects. Dexamethasone work by reducing the release of inflammatory mediators and by inhibiting potassium channel-mediated discharge of C-fibers. Results of human studies proved that the dexamethasone-treated group demonstrated longer duration of sensory and motor blockade than the control <sup>[3]</sup>.

The mechanism by which dexamethasone and dexmedetomidine lengthen the duration of local Anaesthetics are incompletely understood and may ascend from numerous factors. They can decrease local inflammation and delay the duration of nerve block through vasoconstriction by sustaining the local concentration of the local anesthetic <sup>[4]</sup>. Vasoconstriction also impedes the nociceptive impulse transmission along myelinated C fibers. Conceivable mechanisms of dexmedetomidine in lengthening the duration of nerve blocks may also include the inhibition of the hyperpolarization-activated cation. Certain researches suggested that dexmedetomidine may deliver local anesthetic action that blocks the conduction of nerve signals through C and A fibers, not through  $\alpha_2$  action, and may induce the release of enkephalin-like substances at peripheral sites <sup>[5]</sup>.

The present study was conducted to assess the effect of dexmedetomidine and dexamethasone as an adjuvant to ropivacaine in the erector spinae plane block (ESPB) to control postoperative pain after lumbar spine surgery.

### Materials and Methods

This study was designed to be a randomized, double-blinded, prospective efficiency study. The present study was conducted among 60 ASA Grade 1 and 2 patients of either sex, undergoing lumbar spine surgery. Written informed consent was obtained from all the patients involved in this study. Group assignments were determined using simple blind randomization using the sealed envelope technique. Blocks were completed by the authors who did not play any role in data collection or analysis.

**Inclusion criteria:** Adult patients 18-70 years of age, ASA grade 1 and 2, of either sex, undergoing lumbar spine surgery under general anesthesia, patients who understand and comply with the study protocol.

**Exclusion criteria:** CKD, heart disease, pulmonary disease, opioid addiction, history of hypersensitivity to ropivacaine, surgery or revision surgery for neoplastic disorder, inability to provide informed consent due to cognitive dysfunction. Patients were grouped into 3 groups of 20 each. Group I patients received 0.375% ropivacaine 20 mL, Group II patients received 0.375% ropivacaine 20 mL with 8 mg dexamethasone and group III patients received 0.375% ropivacaine 20 mL with 1 µg/kg dexmedetomidine deep to the erector spinae muscle adjacent to transverse processes. Postoperative tramadol consumption, amount of use of rescue analgesia, post-surgical hospital stay and PONV were recorded. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

### General anesthesia management

All patients were given the same anesthesia and analgesia protocol. Premedication with tablet lorazepam 0.04 mg/kg and ranitidine 150 mg at night and 2 h before surgery with sips of water was given to all patients. On reaching to operation room, i. v. access was achieved with 18-gauge venous cannula. Monitoring consisted of 5-lead electrocardiography, pulse oximeter, noninvasive blood

pressure, temperature, and end-tidal CO<sub>2</sub> monitoring. Following preoxygenation with 100% oxygen, patients were induced with fentanyl 2 µg/kg and propofol (1-2 mg/kg). Intubation was eased by vecuronium bromide 0.1 mg/kg and thereafter mechanical ventilation was initiated. Anaesthesia was maintained using 70% nitrous oxide in oxygen and isoflurane 0.5-1% and intermittent boluses of fentanyl and vecuronium as and when required. Ondansetron 8 mg i.v. was given to all the patients approx. 30 min before the end of surgery. At the end of the surgery, reversal of anesthesia was done with injection neostigmine 0.05 mg/kg + glycopyrrolate 0.01 mg/kg and patients were transferred to the postanesthesia care unit (PACU).

### Landmark guided erector spinae block

All blocks were executed under general anesthesia in the prone position under sterile conditions before the beginning of the surgical procedure. The L1 lumbar vertebral level was assessed by counting downwards from cervical level. A mark 3 cm lateral to the spinous process bilaterally was marked. A 22 gauge 10 cm spinal needle was used to contact the transverse process, aspiration test was done to avoid inadvertent vascular injection. Study drugs were given and needle was removed.

### Standard analgesia protocol

The perioperative intravenous analgesia protocol comprises paracetamol 1 gm and fentanyl 0.5 µg/kg bolus as & when required. All patients were followed using a standardized postoperative analgesia protocol which includes IV paracetamol every 6 hrly. Intermittent 1 mg/kg of iv tramadol given to patient. The dosage is repeated every 4 hrly if NRS >4/10 and recorded. For rescue analgesia during 1-24 h, slow intravenous diclofenac sodium aqueous 75 mg was administered if NRS ≥4 even after iv tramadol.

### Result

Table 1 lists patient data. There was no significant difference in intraoperative characteristics among groups, which includes age, height, weight, BMI, Duration of surgery. The duration of surgery was 180.4 minutes, in group II was 152.4 minutes and in group III was 162.8 minutes, consumption of intraoperative fentanyl was 125µg, in group I, 115.3 µg in group II was 100.5 µg in group III. The difference was non-significant ( $P > 0.05$ ).

**Table 1:** Demographic data of patients and intraoperative parameters

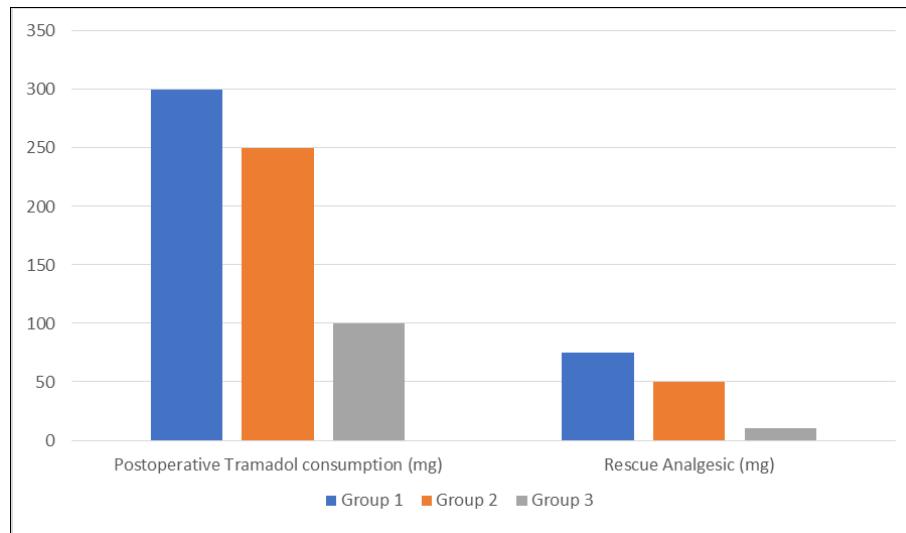
	Group I	Group II	Group III	P
Age (years)	40.61±11.06	43.00± 10.35	45.00±01	0.586
Height(cm)	156.35±6.04	155.16±4.61	154.11±5.5	0.798
Weight(kg)	54.81±9.55	53.39±8.32	50.22±7.2	0.924
BMI (kg.m <sup>-2</sup> )	1.54±0.14	1.51±0.11	1.55±0.12	0.839
Duration of surgery (min)	180.4	152.4	162.8	0.372
Consumption of fentanyl (ug)	125	115.3	100.5	0.562

Table 2, graph I shows that postoperative tramadol consumption was 300 ± 55 mg in group I, 250 ± 40 mg in group II and 100 ± 20 mg in group III, Rescue analgesic use was 75, 50 and 10 mg in group I, II and III respectively, Postoperative stay in hospital was 6.1 days in group I, 6.2

days in group II and 4.6 days in group III. and these differences were significant,  $P < 0.05$ . PONV was 5.2, 5.5 and 4 in group I, II and III respectively and was not significant.

**Table 2:** Comparison of Parameters

Parameters	Group I	Group II	Group III	P value
Postoperative tramadol consumption (mg)	300 ± 55	250 ± 40	100 ± 20	0.02
Postoperative stay in hospital (day)	6.1	6.2	4.6	0.01
Rescue analgesia (Diclofenac)mg	75	50	10	0.001
PONV	5.2	5.5	4	0.81

**Graph 1:** Comparison of Parameters

## Discussion

Interfascial plane blocks have modernized the management of acute perioperative & chronic pain. After the first description of ultrasound-guided erector spinae plane block (ESPB) by Forero *et al.* in 2016, it has been reported to provide analgesia for various indications. Nevertheless, not all hospitals are equipped with ultrasound machines in the operation theatre and/or trained anesthesiologists even in the developed world [6].

Landmark-guided ESPB can be executed with the patient in lateral, prone, or sitting position. The objective is to deposit local anaesthetic into the fascial plane deep to erector spinae muscle which blocks the dorsal and ventral rami of the spinal nerve reliant on the level of injection and the amount of local anesthetic injected. The spinous process of the vertebra and a point 3 cm lateral to it are noticeable at the appropriate level before performing the block. Under aseptic precautions, the needle is inserted and advanced perpendicular to the skin in all planes to contact the transverse process of the vertebra. The transverse process of the lumbar vertebra lies at a variable depth of 2–4 cm from the skin depending on the build of the individual. At this point, the needle tip lies between the erector spinae muscle and transverse process. After negative aspiration, local anesthetic is injected in 3–5 ml aliquots. A volume of 20–25 ml of 0.25% (levo) bupivacaine or 0.2% ropivacaine with or without adjuvants can be used for analgesia on each side depending upon the surgery and requirements.

The present study was conducted to assess the effect of dexmedetomidine and dexamethasone as an adjuvant to 0.375% ropivacaine in erector spinae plane block (ESPB) to control postoperative pain after lumbar spine surgery.

Gao *et al.* [10] conducted a study in which ninety patients, aged 20–65 years who were scheduled to undergo VATLS were enrolled in this trial. VAS score was lower in the ropivacaine with dexmedetomidine (RM) group at wake up and at postoperative 2, 4, 12, and 24 h. The median duration

of sensory blockade was significantly longer in the RM group ( $P=0.001$ ). First request to use the PCA machine in the RM group was prolonged significantly compared with that in the ropivacaine alone (R) group and ropivacaine with dexamethasone (RS) group ( $P < 0.001$ ). Total PCA use, post-surgical hospital stay, and rate of rescue analgesia use in The RM group were reduced significantly compared with those in the R and RS groups.

Similar to these prior study findings, we found that duration of surgery and intraoperative consumption of fentanyl, was not significantly different among groups. Postoperative tramadol consumption and rescue analgesic requirement, and duration of hospital stay was significantly less in group III as compared to group I and II thus proving the efficacy of dexmedetomidine as a better adjuvant to ropivacaine than dexamethasone, in erector spinae plane block. Previous studies have provided possible mechanisms associated with the action of dexmedetomidine to improve blockade efficacy [11, 12].

## Conclusion

Authors found that dexmedetomidine found to be better than dexamethasone as an adjuvant to ropivacaine in Erector spinae plane block for lumbar spine surgery.

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