

Effect of dexamethasone as an adjuvant to bupivacaine in erector spinae block for post operative analgesia in lumbar spine surgery.

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How to citation this article: Dr. Vinod C N, Dr. Kishore Keerthy N, Dr. Krishna Kant Ranjan, “Effect of dexamethasone as an adjuvant to bupivacaine in erector spinae block for post operative analgesia in lumbar spine surgery”, IJMACR- March - 2023, Volume – 6, Issue - 2, P. No. 467 – 472.

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Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Background & Aims: Erector spinae plane block is a newer approach of regional anesthesia for pain management in perioperative pain as well as acute or chronic pain. It is relatively easy to perform and can decrease the consumption of opioids in the peri operative period. In the study we aimed to evaluate the comparative efficacy and safety of perineural dexamethasone as an adjuvant to Bupivacaine in erector spinae plane block for postoperative pain control in people undergoing lumbar spine surgery under general anaesthesia. The primary objective was to assess the pain scores in the post operative period using visual analog scale for 24hrs, and the secondary objective was to compare the duration of post operative analgesia and

total analgesics consumed in first 24hrs post-surgery.

Methods: This study was conducted in 60 patients aged between 18 and 70 years, belonging to the American Society of Anaesthesiologist physical class I and II posted for lumbar spine surgeries under general anesthesia. 30 patients received ESPB with 40ml of 0.25% Bupivacaine + 8mg Dexamethasone and the other 30 patients received ESPB with 40ml of 0.25% Bupivacaine. Mann-whitney test was used for VAS scores and independent student t test was used for duration of analgesia comparison.

Results: VAS scores were higher in Group 2 as compared to Group 1 and statistically significant at 5, 6, 8, 10, 12 h (P-value <0.05). The duration of analgesia was 538.2 ± 52.04 min (8.97±0.86 h) in Group 1 and

345.53±37.32 min (5.75±0.62 h) in Group 2 which was statistically highly significant (P-value <0.001). Patients did not have any untoward experience.

Conclusion: Erector spinae plane block with Dexamethasone as an adjuvant to 0.25% Bupivacaine provided better post-operative pain relief when compared to 0.25% Bupivacaine alone.

Keywords: Erector spinae block, dexamethasone, bupivacaine, postoperative pain

Introduction

Fascial plane blocks are techniques used to manage pain both in the perioperative period and in the treatment of chronic pain. In the recent years there has been an increase in their clinical application. In recent times Erector spinae plane block is one of the newer techniques that has been described.

Erector spinae plane block is a relatively neoteric approach^[1] of regional anaesthesia in pain management of a vast variety of surgical procedures, as well as for acute and chronic pain. It is performed as a single injection block, or a catheter is placed for continued relief. Ultrasound guidance is helpful in performing the procedure. It is an interfascial plane block^[2] that effectively deposits a local Anaesthetic deep into the erector spinae muscle^[3] that lies contiguous to transverse process, it acts by blocking the posterior root of spinal nerve and produce part of the paraspinal block effect. The technique can be performed on patients with a relative ease. Since erector spinae plane block is a relatively newer technique, the wide majority of literature available about the block is in the form of case reports and anecdotal experience.

Research has established that ESPB can be used as a safe and simple substitute technique to decrease the consumption of opioid analgesics post operatively.^[4]

Peripheral nerve block (local Anaesthetic is infiltrated around a nerve) is used for anaesthesia or analgesia. It has a limitation that its analgesic effect for postoperative analgesia lasts only a few hours. Moderate to severe pain at the surgical site may begin the rafter resulting in the need for alternative analgesic therapy. Various adjuvants have been used to prolong the duration of analgesia of peripheral nerve block, including perineural Dexamethasone. Dexamethasone is measured to work by deterring potassium channel mediated discharge of C-fibers.^[5]

Materials and methods

This prospective randomized comparative study was conducted in a tertiary care hospital from February 2022 to September 2022 for a period of 8 months after getting Institutional Ethics Committee approval in accordance with the declaration of Helsinki. The trial was registered before patient enrolment on www.ctri.nic.in (Clinical Trials Registry of India): clinical trial registration number CTRI/ 2022/01/039361; date of registration: 12 January 2022. All participants in the trial gave their written informed consent before participating in the study. Patients aged between 18 to 70 years of either sex with American Society of Anaesthesiologist (ASA) physical status 1 and 2 posted for elective lumbar spine surgeries were included in the study. Participants having body mass index >35kg/m², known allergy to local anesthetics or having severe cardiovascular, renal, respiratory or endocrinal disorders were excluded. Two groups of 30 subjects each was calculated considering the effect size to be measured at 80% for two tailed hypothesis, power of the study at 80% and the alpha error at 5%, the sample size needed is 52. Anticipating 20% attrition rate in each study group, the total sample

size was inflated to 60. Thus each study group comprised of 30 samples. After Simple random sampling Group 1 patients received ESPB with 0.25% Bupivacaine + Dexamethasone while Group 2 patients received ESPB with 0.25% Bupivacaine. The primary objective was to assess the pain scores in the post operative period using visual analog scale for 24hrs, and the secondary objective was to compare the duration of post operative analgesia (defined as time from completion of erector spinae plane block ESPB post-induction till the first analgesic requirement as indicated by VAS >4 and total analgesics consumed in first 24hrs post-surgery).

Each patient was visited preoperatively, the procedure was explained and a written informed consent taken. All routine investigations required for preoperative evaluation and for the proposed surgery were done. All patients were kept nil per oral overnight and were premedicated with Tab. Alprazolam 0.5mg on the night before surgery. On the day of surgery, after shifting the patient to operation table, all ASA standard monitors were connected and base line parameters such as Heart rate, NIBP, ECG, SpO₂, Respiratory rate recorded. The intravenous (IV) cannula was checked for the flow and patency.

All patients were premedicated with Inj Glycopyrolate 0.2mg, Inj Rabeprazole 20mg and preoxygenation with 6litre/min. Patients in both groups were given standard general anesthesia with endotracheal intubation and IPPV and put to prone position.

Immediately after closure of surgical site, Erector spinae plane block under ultrasound guidance was given with the patient in prone position. High-frequency linear probe was used and positioned longitudinally at the level of L1 vertebra in a parasagittal orientation. Tip of the

transverse process of corresponding vertebra was visualized and the target was to open up the plane between the erector spinae muscle and the transverse process. The tip of 23G Quincke's spinal needle was advanced using in-plane technique in a craniocaudal direction to contact the transverse process. After confirmation Erector spinae plane block was given, Group 1 patients received ESP block with 40ml of 0.25% Bupivacaine with 8mg Dexamethasone and Group 2 patients received ESP block with 40ml of 0.25% Bupivacaine

After extubation, pain scores, vital signs and any adverse effects in the post anesthesia care unit were assessed in all patients. Follow up scores and monitoring were done at 0, 1, 2, 3, 4, 5, 6, 8, 10, 12, 24 hours post operatively and rescue analgesic Paracetamol 1g was given if VAS score was >4 and for those complaining of severe pain persistently (VAS>8) Injection tramadol 50mg was given.

Statistical methods: Data was analyzed using SPSS software version-22. Analyzed data presented in suitable tabular and graphical forms. Descriptive analysis of all the explanatory and outcome parameters were done using frequency and proportions for categorical variables,

whereas in Mean & SD for Continuous variables. Mann Whitney Test was used to compare the mean age and VAS scores between 2 groups. Independent Student t test was used to compare the mean duration of analgesia between 2 groups. Chi Square Test was used to compare gender distribution, BMI Status, ASA grades between 2 groups. P value <0.05 was considered as statistically significant.

Results

Seventy patients were assessed for the eligibility, and sixty patients were included. All of them completed the study and were included in the analysis. The age, gender distribution, body mass index (BMI) and ASA physical status was comparable in both the groups and not statistically significant as shown in Tables 1, 2 and 3. Duration of analgesia in group 1 was 538.2 ± 52.04 min (8.97 ± 0.86 h) as compared to 345.53 ± 37.32 min (5.75 ± 0.62 h) in Group 2 which was statistically highly significant (P-value <0.001) as shown in Table 4.

VAS scores were higher in Group 2 as compared to Group 1, not significant at 0, 1, 2, 3, 4, 24h and statistically significant at 5, 6, 8, 10, 12 h (P-value <0.05) as shown in Table 5. The total consumption of analgesics differed in both the groups. Around 73% (n= 22) required one dose of paracetamol (1g), 23% (n= 7) required two doses of paracetamol (1g) and 3% (n= 1) required one dose of paracetamol (1g) along with Tramadol 50mg in group 1 whereas 46% (n= 14) required one dose of paracetamol (1g), 40% (n= 12) required two doses of paracetamol (1g) and 13% (n= 4) required one dose of paracetamol (1g) along with Tramadol 50mg in group 2 as shown in table 6.

Table 1: Age and gender distribution between 2 groups

Variable	Category	Group 1		Group 2		p-value
		Mean	SD	Mean	SD	
Age	Mean	48.86	8.81	52.03	9.29	0.06 ^a
	Range	18 – 70		18 – 70		
		n	%	N	%	
Sex	Males	16	53.33%	18	60.0%	0.60 ^b
	Females	14	46.66%	12	40.0%	

Note: a. Mann Whitney Test; b. Chi Square Test

Table 2: Comparison of BMI status between 2 groups using Chi Square Test

Variable	Category	Group 1		Group 2		p-value
		n	%	N	%	
BMI Status	Normal	12	40.0%	16	53.33%	0.41
	Over Weight	17	56.66%	12	40.0%	
	Obese	1	3.33%	2	6.66%	

Table 3: Comparison of ASA Grade between 2 groups using Chi Square Test

Variable	Category	Group 1		Group 2		P-Value
		n	%	n	%	
ASA	Grade I	17	56.66%	16	53.33%	0.79
	Grade II	13	43.33%	14	46.66%	

Table 4: Comparison of mean Duration of Analgesia (mins) between 2 groups using Independent Student t Test

Parameter	Group	N	Mean	SD	Mean Diff	p-value
Duration of analgesia (min)	Group 1	30	538.20	52.04	192.67	<0.001*
	Group 2	30	345.53	37.32		

*Statistically significant

Table 5: Comparison of mean VAS scores between 2 groups at different time intervals using Mann Whitney Test

Time	Group	N	Mean	SD	Mean Diff	p-value
0 Min	Group 1	30	0.23	0.43	0.03	0.41
	Group 2	30	0.20	0.40		
1 hrs	Group 1	30	0.40	0.49	0.06	0.32
	Group 2	30	0.46	0.50		
2 hrs	Group 1	30	0.76	0.56	0.17	0.16
	Group 2	30	0.93	0.52		
3 hrs	Group 1	30	1.36	0.55	0.14	0.22
	Group 2	30	1.50	0.50		
4 hrs	Group 1	30	1.90	0.48	0.10	0.27
	Group 2	30	2.00	0.45		
5hrs	Group 1	30	2.10	0.48	0.46	0.039*

	Group 2	30	2.56	1.00		
6hrs	Group 1	30	2.63	0.88	1.23	<0.001*
	Group 2	30	3.86	0.81		
8hrs	Group 1	30	3.46	1.04	1.47	<0.001*
	Group 2	30	4.93	0.73		
10hrs	Group 1	30	5.13	1.00	0.70	0.004*
	Group 2	30	5.83	0.74		
12hrs	Group 1	30	6.00	0.74	0.63	0.006*
	Group 2	30	6.63	0.76		
24 hrs	Group 1	30	6.96	0.66	0.14	0.19
	Group 2	30	7.10	0.73		

Table 6: Total consumption of analgesics in 24hr

Variable	Group 1		Group 2	
	N	%	N	%
1 dose of Paracetamol	22	73.33%	14	46.66%
2 dose of Paracetamol	7	23.33%	12	40.00%
1 dose of Paracetamol + 1 dose of Tramadol	1	3.33%	4	13.33%

Discussion

In the current study lower VAS scores were seen postoperatively in the Group 1. This can be credited to the use of Dexamethasone as an adjuvant with Bupivacaine in Erector spinae plane block. Use of adjuvants enhances the efficacy of the block and should be put to routine care of post operative pain management. In 2017 a systematic review of randomized controlled trials (RCTs) comparing perineural dexamethasone with placebo found that the duration of sensory block was significantly longer in the perineural dexamethasone group compared with placebo (mean difference (MD) 6.70 hours, 95% confidence interval (CI) 5.54 to 7.85; participants 1625; studies 27). Postoperative pain intensity at 12 and 24 hours was significantly lower in the perineural dexamethasone group compared with control (MD -2.08, 95% CI -2.63 to -1.53; participants 257; studies 5) and (MD -1.63, 95% CI -2.34 to -0.93; participants 469; studies 9), respectively [6]

ESPB is a newly described technique, Forero et al [1] for treating chronic thoracic neuropathic pain. ESPB acts by neural blockade and central inhibition from direct spread of local anesthetic to the paravertebral or epidural space; analgesia mediated by elevated local anesthetic plasma concentrations due to systemic absorption.[7] Local anesthetic is injected in ESPB, which diffuses along the thoracolumbar fascia and gives effect on the ventral and dorsal rami of spinal nerves producing visceral and somatic analgesia.[8].

A qualitative review of the literature gives knowledge that studies have shown lower use of opioids and a longer time to first analgesic requirement when ESPB is given for post operative management.[9]

A study conducted in 2019 showed that ultrasound-guided continuous thoracic erector spinae plane block within an enhanced recovery program for open cardiac surgery had decreased opioid consumption and improved patient rehabilitation postoperatively.[10] So we can say that the use of ESPB can help improve patient outcome, decrease the consumption of opioid analgesics and mobilize the patient early postoperatively.

Conclusion

Use of dexamethasone as an adjuvant to Bupivacaine in ESPB provides better pain relief post operatively with lower VAS scores and longer duration of analgesia with less consumption of IV analgesics as compared to ESPB with Bupivacaine alone. ESPB can decrease the use of analgesics post operatively for lumbar spine surgeries and adding Dexamethasone further improves the efficacy of the block without any unwanted side effects. Not many studies are available with regard to erector spinae plane block, thus needs more extensive clinical trials to further prove its efficacy.

References

1. Forero M, Adhikary SD, Lopez H, Tsui C, Chin KJ. The erector spinae plane block: a novel analgesic technique in thoracic neuro pathic pain. *Regional Anesthesia & Pain Medicine*. 2016 Sep 1;41(5):621-7.
2. Chin KJ, Adhikary S, Forero M. Is the erector spinae plane (ESP) block a sheath block? A reply. *Anaesthesia*. 2017 Jul;72(7):916-7.
3. Chin KJ, Malhas L, Perlas A. The erector spinae plane block provides visceral abdominal analgesia in bariatric surgery: a report of 3 cases. *Regional Anesthesia & Pain Medicine*. 2017 May 1;42(3):372-6.
4. Chin KJ, Lewis S. Opioid-free Analgesia for Posterior Spinal Fusion Surgery Using Erector Spinae Plane (ESP) Blocks in a Multimodal Anesthetic Regimen. *Spine (Phila Pa 1976)*. 2019 Mar 15;44(6):E379 - E383. doi: 10.1097/BRS.0000000000002855. PMID: 30180150.
5. Gupta R, Nasar N. Comparison of dexamethasone and dexme detomidine as adjuvant to 0.375% Ropi vacaine in erector spinae plane block for lumbar spine surgery: A randomized, double blind, placebo control trial. *IJMA*. 2021;4(4):30-3.
6. Pehora C, Pearson AM, Kaushal A, Crawford MW, Johnston B. Dexamethasone as an adjuvant to peripheral nerve block. *Cochrane Database of Systematic Reviews*. 2017(11).
7. Jinn CK, Kariem EB. Mechanisms of action of the erector spinae plane (ESP) block: a narrative review. *Canadian Journal of Anesthesia*. 2021 Mar 1;68(3):387-408.
8. Kot P, Rodriguez P, Granell M, Cano B, Rovira L, Morales J, Broseta A, De Andrés J. The erector spinae plane block: a narrative review. *Korean journal of Anesthe siology*. 2019 Jun 1;72(3):209-20.
9. Albrecht E, Kern C, Kirkham KR. A systematic review and meta-analysis of perineural dexamethasone for peripheral nerve blocks. *Anaesthesia*. 2015 Jan; 70 (1): 71-83.
10. Macaire P, Ho N, Nguyen T, Nguyen B, Vu V, Quach C, Roques V, Capdevila X. Ultrasound-guided continuous thoracic erector spinae plane block within an enhanced recovery program is associated with decreased opioid consumption and improved patient postoperative rehabilitation after open cardiac surgery—a patient-matched, controlled before-and-after study. *Journal of cardio thoracic and vascular anesthesia*. 2019 Jun 1; 33 (6): 1659-67.