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Corresponding Author
Vishwanath S Bhaire,
Yashoda Hospital, Secunderabad, Telangana, India

Author Designation
[1]Assistant Professor
[2]Junior Resident
[4]Consultant and Head of Neuroanaesthesia
[5]Junior Consultant Neuroanaesthesia
[6]Consultant Anaesthesia

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Single Shot Versus Continuous Infusion in Erector Spinae Plane Block in Spine Surgeries Comparison of Total Opioid and Other Rescue Analgesic Consumption Between Two Groups Post Operatively

[1]Punith K. Gowda, [2]Vindhya Prasad, [3]Niharika Mustari, [4]Vishwanath S. Bhaire, [5]Mohammad Ali Abu Taha and [6]Gajanan Fultambkar

[1]Department of Neuroanaesthesia, Adichunchanagiri Institute of Medical Sciences, B.G Nagara, Karnataka, India
[2]Department of Anaesthesia Yashoda Hospital, Secunderabad, Telangana, India
[3]Department of Anaesthesia, ESI Hospital, Sanath Nagar, Hyderabad, Telangana, India
[4-6]Yashoda Hospital, Secunderabad, Telangana, India

ABSTRACT
Erector spinae plane block (ESPB) as a new trunk fascia block technique was proposed in 2016. Following the first publication and description of the ESP block there has been a vivid interest in this technique mainly for postoperative analgesia. Historically Bupivacaine was used as it had a long duration of action, but subsequently it was found that “propyl derivatives” of pipecoloxylidides were less toxic than ‘butyl derivatives’ (bupivacaine). Thus, Ropivacaine was developed after bupivacaine was noted to be associated with significant less number of cardiac arrests. A prospective double blinded randomized controlled study was conducted on ASA I, II, III patients undergoing lower lumbar spine surgeries under general anaesthesia with bilateral erector spinae block who fulfill inclusion criteria. The use of rescue analgesics was significantly less ($p<0.001$ using student t test) in continuous erector spinae group.

INTRODUCTION

Postoperative pain is often severe in patients undergoing spine surgery. Despite multimodal analgesia regimes, administration of high doses of opioids is often necessary. This can further lead to several adverse effects such as drowsiness, respiratory impairment, itching, ileus as well as postoperative nausea and vomiting. This will hinder early mobilisation and discharge of the patient from the day surgery setting and is suboptimal in an Early Recovery after Surgery setting[1]. Erector spinae plane block (ESPB) as a new trunk fascia block technique was proposed in 2016. Following the first publication and description of the ESP block there has been a vivid interest in this technique mainly for postoperative analgesia. It combines various favorable characteristics like: simplicity to perform, comparative safety of the technique to paravertebral blocks (aiming on bone structure and not towards paravertebral space near the pleura), effective analgesia as spread on several neurotomes[2].

A few trials have explored the effectiveness of single-shot ESP blocks in various surgeries but only 2 studies are available on the continuous erector spinae blocks in open cardiac surgeries and VATS. There are various case reports and case series regarding the usage of continuous erctor spinae plane blocks in spine fusion surgery, thoracotomies, open surgery for pericardial tamponade, hip surgery, breast surgery, etc. Usage of continuous erector spinae in VATS surgery demonstrated that this type of trial is safe and that there are indications of lower opioid consumption and superior analgesia. Study on continuous erector spinae plane block in cardiac surgeries demonstrated significant decrease in intraoperative and postoperative opioid consumption, optimized rapid patient mobilization and exudation immediately post-surgery[3].

Ropivacaine is a new long-acting local anaesthetic drug belonging to the amino amide group. Though it was synthesized by Ekenstam in 1957 and belongs to the same group as that of bupivacaine and mepivacaine, pipecoloxylidides local anaesthetics, ropivacaine was introduced to clinical practice in 1996. Historically Bupivacaine was used as it had a long duration of action, but subsequently it was found that “propyl derivatives” of pipecoloxylidides were less toxic than ‘butyl derivatives’ (bupivacaine). Thus, Ropivacaine was developed after bupivacaine was noted to be associated with significant less number of cardiac arrests. Despite being in the market for close to three decades internationally, it was only introduced into the Indian market very recently. It is the first local anaesthetic to be presented as an almost pure S-enantiomer (>99% pure) It is used as local anaesthestic including infiltration, nerve block, epidural and of late for intrathecal anaesthesia in adults and children over 12 years of age. It is also used for peripheral nerve blocks and caudal epidural in children 1 to 12 years of age for surgical pain relief[4].

MATERIALS AND METHODS

A prospective double blinded randomized controlled study was conducted on ASA I, II, III patients undergoing lower lumbar spine surgeries under general anaesthesia with bilateral erector spinae block who fulfill inclusion criteria. This study was started after getting institutional ethical committee approval and informed written consent from all the patients undergoing the study. They were randomly divided into 2 groups namely group A and group B. Group A (erector spinae plane block-single shot)-patients received 30 ml of 0.2% Ropivacaine and 8mg of dexamethasone (15 ml on each side) under fluoroscopy guidance. Group B (continuous erector spinae block)-patients received a bolus dose of 30ml 0.2% Ropivacaine and 8 mg dexamethasone (15ml each side) under fluoroscopy guidance followed by bilateral catheter placement which is connected to Inj Ropivacaine 0.1% infusion.
Sample Size of Group A-25.
Sample Size of Group B-25.

Inclusion Criteria:

- Patients scheduled for thoracic and lumbar spine surgeries
- Patients 21 years to 75 years old
- American Society of Anaesthesiologists (ASA) physical status I, II and III 4. BMI 18-35 kg/m2

Exclusion Criteria:

- Patients unable to give consent or inability to communicate/cooperate
- Patients with allergy to local anaesthetics or any drugs included in the study
- Infections at the injection site
- Patients with pre-existing neurological deficits in lower limbs
- Patients with peripheral neuropathy
- Patients with renal Impairment (Creatinine>2.0 mg/dl)
- Patients with liver Impairment
- Patients with spine deformity

Preanaesthetic Evaluation:

- All the patients will undergo thorough pre anaesthetic evaluation prior to surgery
- All systems will be examined including the surface anatomy where the block will be given and the procedure to be carried out will be explained to the patients

Table 1: General Information about A and B Group Patients

	Group A (erector spinae plane block-single shot)		Group B(continuous erector spinae block)		Total of Both A and B Group	
	Nos.	Percentage	Nos.	percentage	Nos.	percentage
		Gender of the Patients				
Male	7	28.0	13	52.0	20	40.0
Female	18	72.0	12	48.0	30	60.0
Total	**25**	**100.0**	**25**	**100.0**	**50**	**100.0**
		Age of the Patients				
Up to 40 Years	8	32.0	3	12.0	11	22.0
41 to 59 Years	11	44.0	8	32.0	19	38.0
60 and Above Years	6	24.0	14	56.0	20	40.0
Total	**25**	**100.0**	**25**	**100.0**	**50**	**100.0**
	American Society of Anaesthesiologists (ASA) physical status					
ASA-I = Normal Health	12	48.0	5	20.0	17	34.0
ASA-II = Mild Systemic Disease	9	36.0	16	64.0	25	50.0
ASA-III = Sever Systemic Disease	4	16.0	4	16.0	8	16.0
Total	**25**	**100.0**	**25**	**100.0**	**50**	**100.0**
		BMI 18-35 kg/m2				
Under Weight (<18.5)	0	0.0	0	0.0	0	0.0
Normal Weight (18.51 to 24.99)	5	20.0	4	16.0	9	18.0
Over Weight (25.0 to 29.99)	19	76.0	16	64.0	35	70.0
Obesity Class-I (30.0 to 34.99)	1	4.0	4	16.0	5	10.0
Obesity Class-II (35.0 to 39.99)	0	0.0	1	4.0	1	2.0
Obesity Class-III (40.0 and Above)	0	0.0	0	0.0	0	0.0
Total	**25**	**100.0**	**25**	**100.0**	**50**	**100.0**

Table 2: Rescue analgesics in both study groups

	Rescue Analgesia		
Group	**Mean**	**Std. Deviation**	**p-Value (t-test)**
ESPB	8.76	0.663	<0.001
Continuous Block	1.96	0.841	

Table 3: Details of Rescue Analgesia (Medicines Given to Patient in 3 Days) and Time to Mobilize POD (in Days)

	Group A(erector spinae plane block-single shot)		Group B(continuous erector spinae block		Total of Both A and B Group	
	Nos.	Percentage	Nos.	Percentage	Nos.	Percentage
Rescue Analgesia (Given to Patient in 3 Days)						
0 to 3 times	0	0.0	25	100.0	25	50.0
4 to 7 times	0	0.0	0	0.0	0	0.0
8 to 10 times	25	100.0	0	0.0	25	50.0
Total	25	100.0	25	100.0	50	100.0
Time to Mobilize POD (in Days)						
0 to 1 Day	0	0.0	25	100.0	25	50.0
2 and Above Days (Maximum 4 Days)	25	100.0	0	0.0	25	50.0
Total	25	100.0	25	100.0	50	100.0

Table 4: Correlation Matrix

Descriptive Statistics	Mean	Std. Deviation	N-Sample Size
Age	51.66	13.15	50
ASA	1.82	0.69	50
BMI	27.00	2.53	50
Duration of SX (Surgery) in Minutes	189.32	32.75	50
Rescue Analgesia (Given to Patient in 3 Days)	5.36	3.52	50
Time to Mobilize POD (in Days)	2.02	1.10	50

Table 5: t-test for Rescue Analgesia (Given to Patient in 3 Days) for A and B Group Patients

Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Rescue Analgesia (Given to Patient in 3 Days)	Group A (erector spinae plane block-single shot)	25	8.76	0.663	0.133
	Group B (continuous erector spinae block)	25	1.96	0.841	0.168

- They will be informed about the development of paraesthesia. Patients will be reassured to alleviate their anxieties
- All the patients will be kept nil per oral as per the fasting guidelines
- Written informed consent will be taken

RESULTS AND DISCUSSIONS

The use of rescue analgesics was significantly less ($p<0.001$ using student t test) in continuous erector spinae group. Juan Carlos Luis Navarro *et al*[5]. done a case series of erector spine plane block in abdominal surgeries found that block reduces the need of intravenous analgesics during surgery. Unilateral ESP block during laparoscopic nephrectomy shows a high rate of success and no complications related to either catheter placement or continuous administration. Their case series suggests that it can be used for selective multidermatomal sensory blockade according to surgery or site of pain. For sensory blockade of

cervical, thoracic and lumbar dermatomes, ESP block was administered at level T2, T5 and T7, respectively Kompal Jain, Vikky Jaiswal, Arun Puri[6] done a case series of erector spine plane block for varies surgeries demonstrated that It has wide applications in pain relief ranging from postoperative acute pain in breast surgeries, thoracotomies, and abdominal surgeries to chronic neuropathic pain. They have experienced that ESP block has easily recognizable sonoanatomy with easy insertion of catheter. There are no structures at risk of needle injury in immediate vicinity, Making safer with lesser expertise and no procedural complications as compared to epidural and paravertebral blocks. Swati Singh, Gunjan Kumar, Akhileshwar[7] done Ultrasound guided erector spinae plane block for postoperative analgesia in modified radical mastectomy: A randomized control study shows an effective block for postoperative analgesia in breast cancer surgery. It decreases postoperative morphine requirement. They observed a decrease in postoperative morphine consumption by 65% which was statistically significant, thus establishing its role for analgesia and postoperative opioid sparing effect Adhikary SD, Pruett A, Forero M, Thiruvenkatarajan V[8].conformed Erector spinae plane block as an alternative to epidural analgesia for postoperative analgesia following video-assisted thoracoscopic surgery: A case study and literature review on the spread of local anaesthetic in the erector spinae plane. For thoracic surgeries or rib fractures, ESP block helps for better lung expansion, superior analgesia, allows patient to cough, weaning of mechanical ventilation, and early ambulation.

CONCLUSION

Bilateral continuous erector spinae block is efficacious alternative in providing maximum cut down of opioids and other analgesics (i.v or oral) in post-operative period during hospital stay.

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