Section: Anesthesia

Original Research Article

A PROSPECTIVE RANDOMIZED STUDY OF ERECTOR SPINAE PLANE BLOCK COMBINED WITH GENERAL ANAESTHESIA VERSUS GENERAL ANAESTHESIA IN LUMBAR SPINE SURGERY

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ABSTRACT

Background: The aim of our study was to assess the duration of ESP block as a post-operative analgesic technique by VAS score.

Materials and Methods: The study was conducted in patients at Kaminenei Institute of Medical Sciences, Narketpally, Telangana, India. Total 60 ASA physical grade I, II, patients, satisfying the inclusion criteria, undergoing lumbar spine surgeries were included in the study after obtaining Hospital Ethical Committee approval.

Results: The postoperative hemodynamic variables and side effects were monitored. The results showed that average Visual Analogue Score in patients who received Erector spinae plane block was 1.43±0.568 this was significantly lower than those who did not receive the block Multimodal group it was 3.3±0.702 ($p<0.01$) Further the average time for first analgesic requirement after the administration of ESP block was 900± 135.378 minutes and only 40% members only required was longer in group who received the block than in the Multimodal group 476.74±417.606 minutes among 76.6%. Total analgesic required in 24hours in ESP group was 41.6758.844 mg which is lesser than Multimodal group 105±80.247mg. The postoperative complications like PONV was also less in ESP group when compared to Multimodal group. There was no major complications observed with ESP block. Advantage of ESP block is, that it is distant from all the vital structures like pleura and spinal cord and its sono-anotomy is easily recognisable. There are no structures at risk of needle injury in the immediate vicinity to the site of the block. It provides greater hemodynamic stability and lower requirements for extensive monitoring.

Conclusion: Based on the results, we conclude that ESP block decreases the post-operative pain scores and opioid requirements and can be used as excellent component of multimodal analgesia, which is safe and easily performed with no major complications.

Keywords: ESP Block, PONV, Visual Anlogue score, Complications, Spinal plane block.

INTRODUCTION

The ASA— "Practice guidelines for acute pain management in the perioperative setting".[1] stresses on multimodal therapy with two or more analgesic agents or techniques used in combination for control of postoperative pain. Regional anesthesia has seen a dramatic upsurge since the last decade due to advances in real time imaging techniques which has led to a high success rate and patient safety. Ultrasound guidance helps in precise needle placement, improved success of block and reduced incidence of complications.

ESP block is reported to lead to analgesic effect on somatic and visceral painbyeffecting the ventral rami and rami communicans that include sympathetic

nerve fibers as LAspreads through paravertebral space.[2] They achieve near-ideal operating conditions by producing complete muscular relaxation, maintaining stable intraoperative hemodynamics and provide extended analgesia in the post-operative period.[3]

As LA widely spreads cranially and caudally when performed, we hypothesized that ESP block can effectively be used as an analgesic method for lumbar surgeries.[4] The combination of paracetamol, NSAIDs and opioids in the form of multimodal regimes may be used in management of postoperative analgesia.[4] However, it may be considered that regional anesthesia techniques like ESP block provide most effective analgesia compared to multimodal analgesia with IV analgesics.

Aims and Objectives

Aim

To determine the superiority of ESP block as a mode of postoperative analgesia compared to multimodal analgesia in lumbar spine surgeries.

Primary objective

To assess the duration of ESP block as a post-operative analgesic technique by VAS score.

Secondary Objectives

1. Total Dose of rescue analgesic (Tramadol) required.
2. Time of First dose of rescue analgesic required.
3. Duration of analgesia.
4. Complications.

MATERIALS AND METHODS

Study Area: The study was conducted in patients at Department of Anesthesiology, KIMS Narketpally, Telangana, India.

Study population: Total 60 ASA physical grade I, II, patients, satisfying the inclusion criteria, undergoing lumbar spine surgeries were included in the study after obtaining Hospital Ethical Committee approval.

Study Design: A clinical comparative study.

Sample size: Sample size was decided by consultation with a statistician and based on study done by Vipin goel et al., 5 in 2019

$N=2*(Z_{alpha}+Z_{beta})2(\text{standard deviation})2/D2$

Alpha(α): Type1errorrate Beta (β): Type 2 error rate

D: difference of means

A=Erroristakenas5%, Power=80%, n=sample size with a power of 80%at the 5% significance level.

Group 1= group received bilateral ESP block prior to surgery after induction Group2=Conventional general anaesthesia receiving multimodal analgesia (MMA)

Time frame to address the study

February 2021 to February 2022, Yashoda hospital in Malakpet, Telangana.

Randomization: Computer generated randomization

Inclusion Criteria

1. Patients belonging to age group 18-60 years with
2. ASA grade I and grade II
3. Elective lumbar spine surgeries
4. Weight55kgto75kg

Exclusion Criteria

1. Patients who refuse.
2. Patients with history of bleeding disorders.
3. Patients with local infection at the site of block.
4. Patients with documented neuromuscular disorders.
5. Patients with respiratory compromise/post pneumonectomy having one functional lung.
6. Patients with known allergy to local anesthetic drugs.

Ethical clearance: Clearance was obtained from the Hospital Ethical Committee of Yashoda hospital.

Preanaesthetic Evaluation

All the patients have undergone thorough pre anaesthetic evaluation on the day prior to surgery. Investigations were done depending on the age & associated co-morbidities. All system were examined including airway and surface anatomy where the block was given and the procedure to be carried out was explained to the patients. Patients were reassured to alleviate their anxieties. All the patients were kept nil per oral as per the fasting guidelines. Written informed consent was taken.

Preliminaries

- Written informed consent
- Patient will be kept nil by mouth for at least 6 hours prior to surgery.
- Intravenous access – starting of an intravenous line with 20GIV cannulaon the upper limb under aseptic techniques.
- On arrival of the patient in the operation theatre all standard ASA monitors pulse oximetry, ECG and NIBP are connected.
- Baseline pulse rate, saturation and blood pressure were recorded. Inj. glycopyrrolate 0.2 mg, Inj. midazolam 1mg, Inj. zofer 4mg, Inj. fentanyl 100mcg were given.
- Pre oxygenated for3min after induction with Inj. Propofol 2-5mg/kg and Inj. cis-atracurium 10mg given then under direct laryngoscopy intubation was done.
- Patient was kept in prone position with pressure points taken care of.

Duration of Analgesia (till appearance of pain requiring analgesia).

In both the groups, postoperative rescue analgesia was provided with intravenous tramadol50-100 mg boluses up to a maximum of 400 mg per day was given when the VAS score was >4.

Hemodynamic parameters: Heart Rate, systolic BP (SBP), diastolic BP(DBP) were monitored continuously. Initial bolus dose timing was assumed to be the baseline time. Post-operatively vital parameters were recorded at every 30 minutes till the regression of the block. The anaesthesia record was maintained and changes in heart rate, blood pressure were noted.

Analgesia

The findings suggested that VAS ratings of 0 to 3 can be considered no pain; 4 to 6 mild pain; and 7 to 10, severe pain.

RESULTS

Statistical Methods

The following methods of statistical analysis have been used in this study. The statistical analysis was performed by a statistician using SPSSv25. Categorical data was represented as frequencies and percentages.

In our study 60 patients were taken out of which 38 patients in ASA1group and 22 patients in ASA 2 group. P value 1 which is insignificant.

HEART RATE

Baseline Heart rate in ESP group was (79±9.752) and without ESP group was (77±9.916) and p value 0.557 which is statistically not significant. The heart rate was monitored intraoperatively in both groups, after induction, after incision, at 10, 20,30 mins,1,1.5,2, 2.5 hours, there was not statistically difference in mean heart rate in both groups at majority of the points. The heart rate was monitored post operatively in bothgroupsat1, 2,4,8,16,24 hours, in which (p value <0.001) clinically significant.

SYSTOLIC BLOOD PRESSURE MONITORING

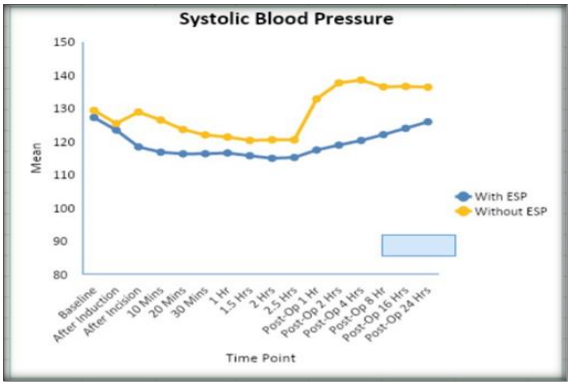

Figure 1: Mean systolic Blood pressure

Mean Baseline systolic bp in ESP group was127±12.028 and without ESP group was 129.37±9.3 with (pvalue0.445) which is clinically insignificant. The systolic BP was monitored intraoperatively in both groups, after induction, after incision, at10,20,30mins, 1, 1.5, 2, 2.5 hours, there was statistically difference in systolic BP in both groups Which was clinically significant at majority of points. The systolic BP was monitored post operatively in both groups at 1,2,4,8,16,24 hours, in which (p value <0.001) clinically highly significant.

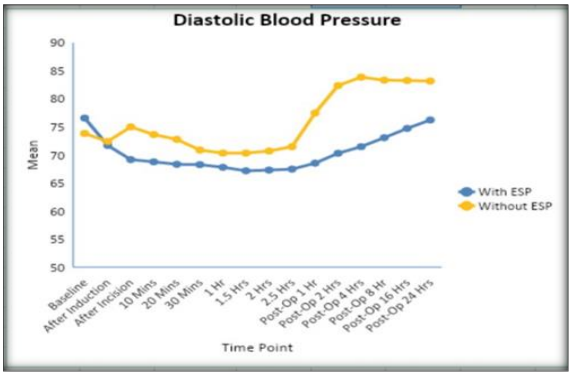

Figure 2: Diastolic blood n pressure

COMPARISON OF DIASTOLIC BP IN BOTH GROUPS

Diastolic BP in both the groups baseline and intraoperatively monitored at after induction, after incision, at 10, 20, 30 mins, 1, 1.5, 2, 2.5hours, there was statistically difference in systolic BP in both groups Which was clinically significant at majority of the points. The diastolic BP was monitored post operatively in bothgroupsat1,2,4,8,16,24 hours, in which (p value <0.001) clinically highly significant.

COMPARISON OF VAS SCORE IN BOTH GROUPS

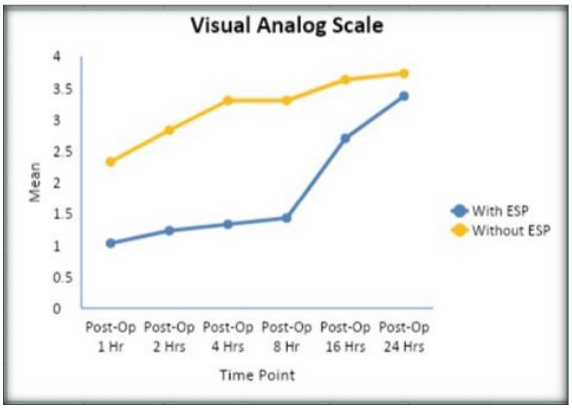

Figure 3: VAS Score

VAS score at 1,2,4,8,16 hours postoperatively (p value <0.001) which was clinically highly significant and at 24 hours p value was 0.08 which was clinically insignificant.

Time of first rescue analgesic given in ESP group was 900±135.378 minutes and without ESP group was 476.74±417.606 minutes, with P value of 0.002which is clinically significant.

Total dose of analgesic required in first 24 hours in ESP group is 41.67±58.844, without ESP group 105±80.247 with p value 0.001 which is clinically significant.

DURATION OF ANALGESIA IN ESP GROUP

Mean duration for which the block acted effectively was 983.50±89.019 mins. It is taken from time of block given.

Occurrence of nausea in ESP block was 4 out of 30(13.33%), without ESP block 5 out 0f 30(16.67%), with p value 0.718 which is clinically insignificant.

Table 7. Vomiting

Occurrence of vomiting in ESP block group was 6.67%, where as in without ESP group was 10% with p value 0.64 which is clinically insignificant.

PRURITIS

Out of 30 patients in ESP block only 2 patients were observed to have pruritis. Nopruritisin without ESP block was observed.

HAEMORRHAGE

There was no haemorrhage observed in both the groups.

Table 1: Number of people in each group according to age GROUP

Age (Years)	Group		Total
	With ESP	Without ESP	
<=30	8	8	16
31 - 45	10	14	24
46 & Above	12	8	20
Total	30	30	60

Table 2: % of people according to age group in each group

AGE	With ESP	Without ESP
<=30	26.67%	26.67%
31-45	33.33%	46.67%
46and above	40%	26.67%

Table 3: Comparison of ASA Groups Between Two Groups

ASA	GROUP				TOTAL
	WITH ESP		WITHOUT ESP		
1	19	63.33%	19	63.33%	38
2	11	36.33%	11	36.33%	22
TOTAL	30	100%	30	100%	60

Table 4:

HR	Group		P Value
	With ESP	Without ESP	
Baseline	79 ± 9.752	77.5 ± 9.916	0.557
After Induction	80.9 ± 8.466	73.97 ± 6.73	0.001
After Incision	73.6 ± 6.621	76.87 ± 7.59	0.081
10 Mins	72.03 ± 5.58	77.83 ± 7.26	0.001
20 Mins	71.53 ± 5.419	76.4 ± 6.162	0.002
30 Mins	71.27 ± 5.051	74.17 ± 6.56	0.06
1 Hr	70.9 ± 5.261	73.07 ± 5.45	0.123
1.5 Hrs	70.83 ± 5.299	71.77 ± 5.21	0.494
2 Hrs	70.53 ± 4.833	69.9 ± 4.483	0.601
2.5 Hrs	70.6 ± 4.215	69.6 ± 3.829	0.34
Post-Op 1 Hr	71.17 ± 6.204	69.57 ± 3.79	0.233
Post-Op 2 Hrs	70.97 ± 5.678	85.53 ± 7.25	<0.001
Post-Op 4 Hrs	73.17 ± 5.24	86.97 ± 5.70	<0.001
Post-Op 8 Hr	74.87 ± 4.424	88.57 ± 5.09	<0.001
Post-Op 16 Hrs	77.53 ± 4.24	87.23 ± 5.84	<0.001
Post-Op 24 Hrs	79.8 ± 3.21	84.97 ± 4.97	<0.001

Table 5: Comparison between both groups in time of first rescue analgesic given

Group	Time of First Resque Analgesic Given (Mins)			P Value (t-test)
	N	Mean	Std. Deviation	
With ESP	12	900.00	135.378	0.002
Without ESP	23	476.74	417.606	

Table 5: Comparison between both groups in total dose of analgesic requirement

Group	Total Dose of Resque Analgesic Requi		P Value (t-test)
	Mean	Std. Deviatic	
With ESP	41.67	58.844	0.001
Without ESP	105.00	80.247	

NAUSEA

Table 6: Nausea

Nausea	Group		Total
	With ESP	Without ESP	
Yes	4	5	9
No	26	25	51
Total	30	30	60

Table 7: Vomiting

Vomiting	Group		Total
	With ESP	Without ESP	
Yes	2	3	5
No	28	27	55
Total	30	30	60

DISCUSSION

Pain is what patient says, hurts. Thus, the emphasis is on patient's experience. Pain is not just aphysical sensationbutalsoanemotionalexperience.

PainisderivedfromLatinword'Poena''means punishment. It has been described in terms of danger very aptly by the International Association for the Study of Pain (IASP) as ―An unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage.[6]

ESP block has shown to reduce postoperative pain scores and opioid consumption, allowing for early ambulation and faster discharge, after lumbar spine surgeries.

Managing pain following spine surgery is challenging. The analgesic regimen should be effective, safe and devoid of side effects.

Postoperative pain after lumbar spine surgeries is due to activation of different mechanisms, which include nociceptive, neuropathic, inflammatory. The intensity of postoperativepainis directly proportional to the number of vertebrae involved in the surgery. Peripheral and Central sensitization contributes to increased pain. The region of surgery does not seem to have bearing on pain severity, and it is similar in surgeries of cervical, thoracic, or lumbar spine.

Different modalities have been described to provide postoperative analgesia in patients undergoing lumbar spine surgeries. The choice of technique will of course vary depending on practitioners' and patients' preferences, comorbidity and type of surgery.

Sukhminder Jit Singh Bajwa et al,[4] proposed different modalities of pain management after spine surgeries.

DEMOGRAPHIC DATA

Patients in group ESP and without ESP(MMA) group in the age group <= 30 years was 26.33%, between 31 and 45 was 33.33% and 46.67%, and above 45 years was 40 and26.67% with p value 0.48 which signifies that the two groups were comparable with regards to Age.

The percentage of males in ESP group was 43.33% and females 56.67%. The percentage of males in without ESP (MMA) group was 50% and females 50%. ThePvalueis0.605which was not significant showing that the groups were comparable with regards to sex.

The percentage of ASA Grade1 patients in groupESPwas63.33%, ASA2 was 33.37%. The percentage of ASA Grade 1 patients in group ESP was 63.33%, ASA 2 was 33.37%. The P value is 1 which was not significant showing that the groups are comparable with regards to ASA Grade.

The age, sex and ASA grade of the patients in both groups were comparable which shows that the patients of equal age, sex and ASA grade were enrolled in the study.

The patients in both groups in the present study compare favourably with those of other studies. The demographic data such as age, sex and ASA grade and were comparable in both groups and seems to have no influence on outcome of the study.

HEARTRATE

The Baseline Mean Heart Rate in Group ESP was 79±9.752 BPM and in Group MMA was 77±9.916 BPM, (p =0.557) which is statistically not significant.

The heart rate was monitored intraoperatively in groups, after induction, after incision, at 10, 20,30mins, 1, 1.5, 2, 2.5 hours, there was not statistically difference in mean heart rate in both groups at majority of the points. The heart rate was monitored post operatively in both groups at 1, 2,4,8,16,24 hours, in which (p value <0.001) clinically significant.

Similar results were obtained in the study conducted by EZZZT et al,[7] for group I (ESP), the mean heart rate values were 79.20 ± 12.46 and 74.0 ± 8.79 beats/min after stimulus and first-time interval respectively, while for group II (MMA), the mean heart rate values were 88.07 ± 10.22, 81.00 ± 8.03 beats/min at the same time intervals. So, there were statistically significant differences between the two groups after stimulus and at the first-time interval (p values 0.042, 0.031) respectively.

SYSTOLIC BLOOD PRESSURE MONITORING

Baseline systolic bp in ESP group was 127±12.028andwithoutESPgroupwas129.37±9.3

with (p value 0.445) which is clinically insignificant.

The systolic BP was monitored intraoperatively in both groups, after induction, after incision, at10, 20, 30 mins,1,1.5,2,

2.5 hours, there was statistically difference in systolic BP in both groups Which was clinically significant at majority of points. The systolic BP was monitored postoperatively in both groups at 1, 2,4,8,16,24 hours, in which (p value <0.001) clinically highly significant.

Diastolic BP in the group ESP baseline 76.57±10.887and in MMA group 73.83±

with p value 0.271 intraoperatively monitored at after induction, after incision, at 10,20,30 mins, 1, 1.5, 2, 2.5hours, there was statistically difference in systolic BP in both groups Which was clinically significant at majority of the points. The diastolic BP was monitored post operatively in both groups at 1,2,4,8,16, 24 hours, in which (p value <0.001) clinically highly significant.

TIME OF FIRST RESCUE ANALGESIC GIVEN

First time rescue analgesic given in ESP group was 900±135.378 minutes in which only12 members out of 30 required analgesic in first 24 hours. In MMA group it was 476.74± 417.606 minutes in which 23 out of 30 members required analgesic infirst24hours.Withp value of 0.002 which is clinically significant.

This study is similar to study done by Swathi singh et al,[3] first dose of rescue analgesia after 5.8± 0.75 hours compared with 2.42± 0.59 hours in the controlgroup(P=0.003)which was clinically significant.

Similar to study conducted by Yayik.A.M et al,[8] Time to first analgesic requirement was significantly longer in the ESP Group than in the Control Group (325.17±22.82 minutesand 174.17 ±22.82 minutes, respectively; P < 0.001).

TOTAL DOSE OF ANALGESIC REQUIREMENT

In our study, majority of the Group ESP patients 40% only and 76.6% of Group MMA needed rescue analgesia by the end of 4 hours This difference in analgesic requirement was statistically significant with p value 0.001.

This is similar to the study done by Vipin goel et al,[5] The block group,as compared to the control group, had a significantly lower Total Opioid Consumption (TOC) (fentanyl) in the first 24 hours following induction (105.0 ± 15.15 vs 158.00 ±23.38 mcg; p < .001).

In our study we took Tramadol as rescue analgesic. Tramadol requirement in first 24 hours in ESP group was 41.67±58.844 mg, in MMA group was 105±80.247 mg, withpvalue0.001 which is clinically significant.

COMPLICATIONS

In our study we observed that nausea among ESP block was 13.33% and in MMA group was 16.67% with p value 0.718, which is statistically insignificant.

Post-operative vomiting's in ESP group was 6.67% and MMA group was 10% with p value 0.64, which is statistically not significant.

It was similar to the study done by Gülçin Hacıbeyoğlu et al,[9] that PONV present in all patients in the control group, and it was severe in 40%. wheareas, 24%ofthepatientsinthe ESP group did not have nausea-vomiting.

In study conducted by Fu, Junbao et al,[10] ponv in patients undergoing hepatectomy surgeries 2 out of 30 (6.7%) in ESP group experienced PONV and 8out of 30(26.7%) in non-block group experienced PONV.

Only 2 out of 30 patients was observed to have pruritis and surgical site bleeding has not occurred in any patient. In study conducted by Fu, Junbao et al,[10]

10% of ESP group patients, 13.3% in no intervention group experieced pruritis.

CONCLUSION

Based on the results, we conclude that ESP block decreases the post-operative pain scores and opioid requirements and can be used as excellent component of multimodal analgesia, which is safe and easily performed with no major complications.

Conflict of Interest: None
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