

ORIGINAL RESEARCH

Study the efficacy of ropivacaine versus bupivacaine as a post-operative analgesia in patients undergoing abdominal surgeries by using ultrasound guided Transversus abdominis plane block in a tertiary care hospital

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ABSTRACT

Transversus abdominis Plane block is a regional anaesthetic technique which provides analgesia in abdominal surgeries particularly where the somatic pain forms the main component of pain, from the incision of the anterior abdominal wall. TAP block provides sensory blockade of the skin over the abdominal wall by deposition of local anaesthetic drugs in the neurovascular plane between internal oblique aponeurosis and transverse abdominis muscle. We evaluated the efficacy of bilateral TAP block using Ropivacaine & Bupivacaine for abdominal surgeries done under general anaesthesia in a prospective, randomized, observational, double blinded study. **Methodology:** The present study is a randomized, double blinded, controlled study which was conducted in department of anesthesiology, NRI Institute of Medical Sciences, Sangivalasa, Visakhapatnam during the period of 12 months from 1st January 2022 to 31st January 2023. A total of 90 patients were divided into two groups of 45 each as Group R and Group B. Using ultrasound guided technique TAP block was used among both the groups, in which Patients in the Group R received 15ml of 0.5% ropivacaine where as in the Group B received 15ml of 0.25% bupivacaine on either side. Hemodynamic parameters & VAS score were measured immediate postoperatively and at every 2nd hours till the time for rescue analgesia. Data was spread over MS office excel and analysis was done. Descriptive analysis was carried out by mean and standard deviation for quantitative variables, frequency and proportion for categorical variables. Data was also represented using appropriate diagrams like bar diagram, pie diagram and box plots. Statistical analysis was made with IBM SPSS 20.0 software and P value of <0.05 was considered significant. **Results:** Hemodynamic parameters like heart rate, systolic blood pressures & diastolic blood pressures between the Group B and Group R showed statistical significance with p values at 2nd <0.0001, <0.0002 & <0.038 and 4th hourly <0.0001, <0.0001 & <0.0001 respectively. VAS score between the two Groups B and Group R at 2nd and 4th hour was also statistically significant with p values <0.00001 & 0.00001 respectively. **Conclusion:** AS score of 4 was attained at 1020 minutes and 660 minutes in Group R and Group B respectively showing that the request time for rescue analgesia was prolonged in the Group R compared to Group B. Ropivacaine with its inherent advantages is more effective when compared with Bupivacaine for providing post-operative analgesia for prolonged time period.

Key words: Transversus abdominis plane block, ropivacaine, bupivacaine, abdominal surgery

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INTRODUCTION

Pain is described as an "unpleasant sensory and emotional experience connected with existing or potential tissue damage or explained in terms of such damage" by the international Association for the study of pain.¹ An ideal approach should offer fair levels of post-operative patient satisfaction, good pain treatment and few adverse effects. Opioids, NSAIDs, regional anesthetic procedures, and field block techniques are only a few of the therapy approaches that can effectively manage post-operative pain.² Opioids are first used as a part of post-operative analgesic regimen. They may result in adverse effects such as nausea, itching, drowsiness, and respiratory depression. Hence it will be advantageous with an alternative regimen that decreases the need for opioids.^{3,4} The discipline of using ultrasound guided regional anesthesia technique is still developing, but it has a lot to offer both emergency and planned surgeries.⁵ The thoracolumbar inter-coastal nerves, which originate from the anterior divisions of spinal segmental nerves T6 to L1, are blocked by the ultrasound-guided transverse abdominis plane (TAP) block, which involves the infiltration of local anesthetics in between the plane formed by the transverse abdominis and internal oblique muscles. There are several ways to approach the transverse abdominis plane. The most typical approach is through the lumbar triangle of Petit, and blocking using this way is helpful for procedures below the umbilicus.⁶ The umbilicus receives analgesia via a sub-coastal approach. Both supra and infra umbilical procedures benefit from an oblique sub coastal transverse plane approach.⁷ The aim of this study is to compare the efficacy of ultrasound guided Transversus abdominis plane block using 0.5% ropivacaine versus 0.25% bupivacaine for post-operative analgesia in patients undergoing abdominal surgeries under general anesthesia. Objectives of this study is to compare efficacy of the two drugs given in ultrasound guided Transversus abdominis plane (TAP) block for post-operative duration of analgesia between the groups. To study the time required for rescue analgesia after Transversus abdominis plane (TAP) block. To monitor the hemodynamic parameters during the study.

MATERIALS & METHODS

This study was conducted in the Department of anesthesia, general surgery and gynecology of

NRIIMS, Visakhapatnam. Study participants were patients of both genders with ASA grade 1 and 2 physical status of age between 18 to 60 years undergoing different abdominal surgeries under general anesthesia. Study was approved by institutional ethics committee. Informed and written consent was obtained from all the study participants and only those participants willing to participate in the study were included. The current study was a prospective randomized study. As per the convenience sample method the sample size was 90. All patients were randomly allocated into following two groups: Group B: 45 patients received bilateral ultrasound guided transverse abdominis plane block with Bupivacaine 0.25% and Group R: 45 patients received bilateral ultrasound guided transverse abdominis plane block with ropivacaine 0.5%. The present study was conducted among 90 individuals during the period of 12 months from 1st January 2022 to 31st December 2022. Inclusion Criteria: ASA grade I & II, age between 18 to 60 years, both the genders, Lower abdominal surgeries Who have given valid consent. Exclusion Criteria: Unwilling patients, Allergy to local anesthetics, Coagulopathy, Severe cardiovascular, respiratory, renal and hepatic diseases, H/o seizures and any neurological deficit. Data was spread over MS excel and analysis was done. Descriptive analysis was carried out by mean and standard deviation for quantitative variables, frequency and proportion for categorical variables. Data was also represented using appropriate diagrams like bar diagram, pie diagram and box plots. Statistical analysis was made with SPSS 20.0 software and P value of <0.05 was considered significant.

RESULTS

In current study, majority of patients (57.8%) belong to age group of 21 to 30 years followed by 17.8% of patients belong to age group of 31 to 40 years, mean age of 31.33 ± 10.19 years in group B. Majority of patients (51.1%) belong to age group of 21 to 20 years followed by 20% of patients belong to age group of 31 to 40 years, mean age of 29.87 ± 8.99 years in group R. There is no significant difference in the proportion of participants by age in both the groups (P value 0.471). In current study, 53.3% of patients are males and 46.7% of patients are females in group B whereas 51.1% of patients are males and 48.9% of patients are females in group R. There is no statistical significance (P value 0.833).

Table 1: Comparison of ASA grading in patients among the study groups (n=90)

ASA	Group B		Group R	
	N	%	N	%
I	35	77.8	37	82.2
II	10	22.2	8	17.8
Total	45	100.0	45	100.0
Chi square	0.28			
P value	0.598			

In current study, 77.8% of patients belong to ASA grade I and 22.2% of patients belong to ASA grade II in group B where as 82.2% of patients belong to ASA grade I and 17.8% of patients belong to ASA grade II in group R. There is no statistical significance (P value 0.598).

Table 2: Comparison of mean body mass index of the patients among the study groups (n=90)

Parameter	Group B		Group R	
	Mean	SD	Mean	SD
BMI (kg/m ²)	22.23	2.13	21.98	1.01
P value	0.472			

In current study, the mean BMI of the patients in group B was 22.23 ± 2.13 kg/m² whereas the mean BMI of the patients in group R was 21.98 ± 1.01 kg/m². There was no statistical significance (P value 0.472)

Table 3: Comparison of mean duration of surgery in patients among the study groups (n=90)

Parameter	Group B		Group R	
	Mean	SD	Mean	SD
Duration of surgery (min)	128.29	39.34	131.20	38.36
P value	0.723			

In current study, the mean duration of surgery of the patients in group B was 128.29 ± 39.34 min whereas the mean duration of surgery of the patients in group R was 131.2 ± 38.36 min. There was no statistical significance (P value 0.723).

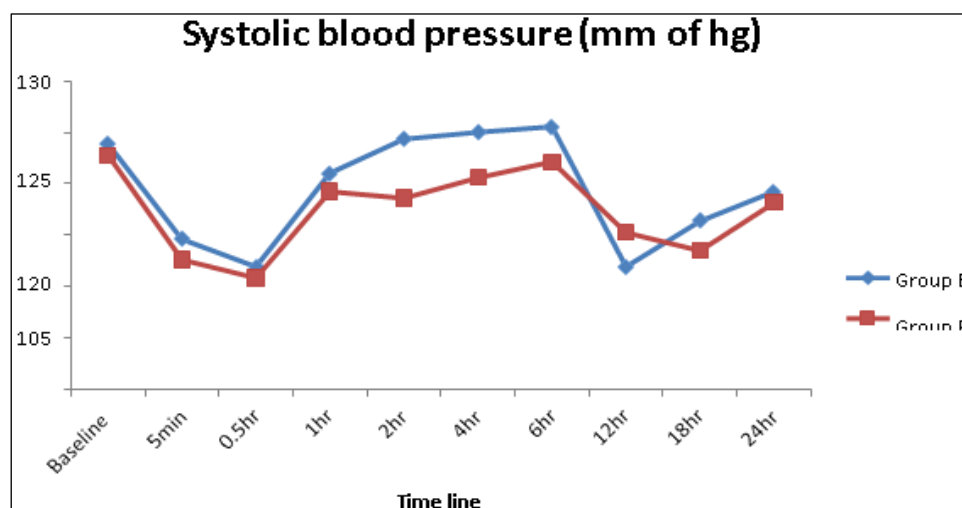


Figure 1: Comparison of mean systolic blood pressure in patients among the study groups (n=90)

In current study, systolic blood pressure was recorded during baseline, 5min, 0.5hours, 1hours, 2hours, 4hours, 6hours, 12hours, 18hours and 24hours. There was significantly decrease in systolic blood pressure among patients of group R when compared with

patients of group B during 2hr, 4hr and 6hr (P value <0.05). Mean systolic blood pressure was comparable among the study groups during baseline, 5min, 0.5hr, 1hr, 12hr, 18hr and 24hr (P value >0.05).

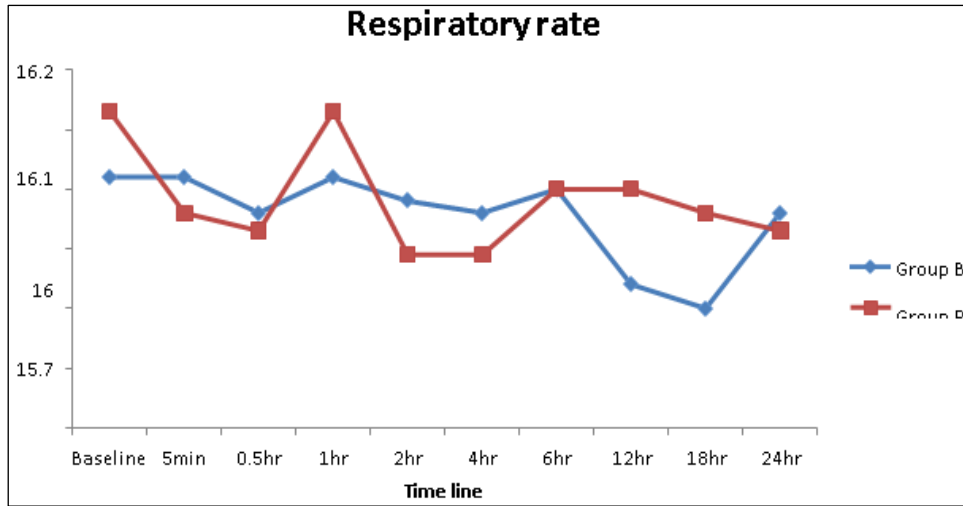


Figure 2: Comparison of mean respiratory rate in patients among the study groups (n=90)

In current study, respiratory rate is recorded during baseline, 5min, 0.5hours, 1hours, 2hours, 4hours, 6hours, 12hours, 18hours and 24hours. Mean respiratory rate is comparable among the study groups during baseline, 5min, 0.5hr, 1hr, 2hr, 4hr, 6hr, 12hr, 18hr and 24hr (P value >0.05).

Table 4: Comparison of mean duration of analgesia in patients among the study groups (n=90)

Parameter	Group B		Group R		P value
	Mean	SD	Mean	SD	
Duration of analgesia (hrs)	11.02	1.73	17.82	2.65	0.000

In current study, the mean duration of analgesia in patients of group B was 11.02 ± 1.73 hrs. Whereas the mean duration of analgesia in patients of group R was 17.82 ± 2.65 hrs. There was significantly longer duration of analgesia among patients of group R when compared with patients of group B (P value 0.00).

Table 5: Comparison of mean total analgesia doses in 24hrs in patients among the study groups (n=90)

Parameter	Group B		Group R		P value
	Mean	SD	Mean	SD	
Total analgesic doses in 24 hrs	2.42	0.75	1.31	0.56	0.000

In current study, the mean total analgesic dose in 24hrs in patients of group B was 2.42 ± 0.75 whereas the mean total analgesic dose in 24hrs in patients of group R was 1.31 ± 0.56 . There were significantly lesser doses of analgesia required in 24hrs in patients of group R when compared with patients of group B (P value 0.000).

DISCUSSION

In current study, majority of patients (57.8%) belong to age group of 21 to 30years followed by 17.8% of patients belong to age group of 31 to 40 years, 11.1% of patients belong to age group of 41 to 50years, 8.9% of patients belong to age group of less than 20years and 4.4% of patients belong to age group of 51 to 60years with mean age of 31.33 ± 10.19 years in group B. Majority of patients (51.1%) belong to age group of 21 to 20 years followed by 20% of patients belong to age group of 31 to 40 years, 17.8% of patients belong to age group of less than 20years, 6.7% of patients belong to age group of 41 to 50years and 4.4% of patients belong to age group of 51 to 60years with mean age of 29.87 ± 8.99 years in group R. There was no statistical significance (P value

0.471).According to a study done by Fuladi N *et al.*⁸ on comparison of bupivacaine 0.25% versus ropivacaine 0.5% in Transversus abdominis plane block for postoperative analgesia in lower abdominal surgeries. In that study the mean age of the patients in the group S was 42.04 ± 15.95 years, the mean age of the patients in the group B was 44.28 ± 16.04 years and the mean age of the patients in the group R was 47.56 ± 15.48 years which was not statistically significant. In current study, 53.3% of the patients were males and 46.7% of the patients were females in group B whereas 51.1% of the patients were males and 48.9% of the patients were females in group R. which was not statistically significant (P value 0.833).According to a study done by Raghunath P *et al.*⁹, 88% of the patients were males and 12% of them were females in group L whereas 92% of them were males and 8% of them were females in group R. In current study, 77.8% of patients belong to ASA grade I and 22.2% of patients belong to ASA grade II in group B whereas 82.2% of patients belong to ASA grade I and 17.8% of patients belong to ASA grade II in group R. There was no statistical significance (P value 0.598). In a study done by Sharma N *et al.*¹⁰ 74%

of patients belong to ASA grade I and 26% of them belong to ASA grade II in group A whereas 76% of them belong to ASA grade I and 24% of them belong to ASA grade II in group B where there was no significance (P value 1.000). In current study, the mean BMI of the patients in group B was $22.23 \pm 2.13 \text{ kg/m}^2$ whereas the mean BMI of the patients in group R was $21.98 \pm 1.01 \text{ kg/m}^2$, which was not statistically significant (P value 0.472). In a study done by Puchakal D *et al.*¹¹, the mean body mass index of the patients in group B was $25.99 \pm 3.32 \text{ kg/m}^2$ whereas the mean body mass index of the patients in group R was $26.96 \pm 2.64 \text{ kg/m}^2$ which was not statistically significant (P value 0.179). In current study, the mean duration of surgery of the patients in group B was $128.29 \pm 39.34 \text{ min}$ whereas the mean duration of surgery of the patients in group R was $131.2 \pm 38.36 \text{ min}$. This was not statistically significant (P value 0.723). In a study done by Sinha *et al.*¹², demographic factors such as age, weight of the patients, height of the patients and duration of surgery was comparable among study groups (P value >0.05).

In current study, systolic blood pressure was recorded during baseline, 5min, 0.5hours, 1hours, 2hours, 4hours, 6hours, 12hours, 18hours and 24hours. There was significant decrease in systolic blood pressure among patients of group R when compared with patients of group B during 2hr, 4hr and 6hr (P value <0.05). Mean systolic blood pressure was comparable among the study groups during baseline, 5min, 0.5hr, 1hr, 12hr, 18hr and 24hr (P value >0.05). In current study, respiratory rate was recorded during baseline, 5min, 0.5hours, 1hours, 2hours, 4hours, 6hours, 12hours, 18hours and 24hours. Mean respiratory rate was comparable among the study groups during baseline, 5min, 0.5hr, 1hr, 2hr, 4hr, 6hr, 12hr, 18hr and 24hr (P value >0.05). In current study, mean duration of analgesia in patients of group B was $11.02 \pm 1.73 \text{ hrs}$ whereas the mean duration of analgesia in patients of group R was $17.82 \pm 2.65 \text{ hrs}$. There was significantly longer duration of analgesia among patients of group R when compared with patients of group B (P value 0.00). In a study done by Preethi V *et al.*¹³, mean duration of analgesia in patients of group B was $410.73 \pm 297.85 \text{ mins}$ whereas duration of analgesia in patients of group R was $747.5 \pm 394.7 \text{ min}$ where there was significantly longer duration of analgesia in patients of group R when compared with patients of group B (P value <0.001). In a study done by Sumathi *et al.*¹⁴, mean duration of analgesia in patients of group A was $486 \pm 32.31 \text{ min}$ whereas mean duration of analgesia in patients of group B was $404 \pm 57.82 \text{ min}$ where there was significantly longer duration of analgesia in patients of group A when compared with patients of group B (P: value <0.0001). In current study, the Mean total analgesic dose in 24hrs in patients of group B was 2.42 ± 0.75 whereas the mean total analgesic dose in 24hrs in patients of group R was 1.31 ± 0.56 . There were

significantly lesser doses of analgesia required in 24hrs in patients of group R when compared with patients of group B (P value 0.000). In a study done by Sharma N *et al.*¹⁰ showed that the mean time for first rescue analgesia was $9.92 \pm 4.81 \text{ hrs}$ in group B whereas the mean time for first rescue analgesia was $12.61 \pm 5.13 \text{ hrs}$ in group R where there was significantly longer duration for first rescue analgesia in patients of group R when compared with patients of group B (P value 0.045).

CONCLUSION

From the present study, we conclude that 0.5% Ropivacaine provide longer duration of analgesia than 0.25% Bupivacaine when used in TAP block for providing postoperative analgesia after lower abdominal surgeries. As we used USG guided block in our study it provided accurate results and has an excellent safety profile. It shows outstanding clinical utility in terms of reliability & effective analgesia. Intraoperative and Postoperative hemodynamics were maintained adequately in both the study groups.

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