Journal of Cardiovascular Disease Research

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE02, 2024

Original research article

A COMPARATIVE CLINICAL STUDY BETWEEN 0.75% ROPIVACAINE VERSUS 0.75% ROPIVACAINE WITH BUPRENORPHINE FOR SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK UNDER ULTRASOUND GUIDANCE

[1]Dr. Rajeev Keerthi KL, [2]Dr. Shashikiran DS, [3]Dr. Shruti Bhushan Aparajita, [4]Dr. Madhu KR, [5]Dr.Ullas Mahesh

[1, 3]Assistant Professor, Siddaganga Medical College & Research Institute, Tumkur, Karnataka, India

[2]Associate Professor, Siddaganga Medical College & Research Institute, Tumkur, Karnataka, India

[4]Professor, Siddaganga Medical College & Research Institute, Tumkur, Karnataka, India

[5]Professor, Dhanalakshmi Srinivasan Medical College & Hospital, Trichy, Tamil Nadu, India

Corresponding Author:
Dr. Rajeev Keerthi KL

Abstract

Background and Objectives: The use of ultrasound has gained popularity in the field of regional anaesthesia for upper limb surgical procedure, as it provides a direct visualization of the anatomic structures and allows a dynamic vision of needle movement and local anaesthetic spread. In the present study, we chose Buprenorphine as an adjuvant to Ropivacaine for ultrasound guided supraclavicular brachial plexus block based on hypothesis that the duration of action after single injection is limited when local anaesthetic alone is used and to prolong its effect, wide range of additives have been used in combination with local anesthetics to promote analgesia.

Methodology: After obtaining ethical committee clearance, 60 patients of either sex in the age group of 25 to 60 years, with ASA status I and II, undergoing elective upper limb surgeries under ultrasound guided supraclavicular brachial plexus block, at Adichunchanagiri Institute of Medical Sciences, B.G. Nagara, Mandya, were randomly divided into two groups of 30 each. Group RP received Ropivacaine 0.75% 19 ml + Normal saline 1 ml (placebo). Group RB received Ropivacaine 0.75% 19 ml + Buprenorphine 75mcg (1ml). The time of onset and duration of sensory and motor blockade, duration of analgesia, occurrence of haemodynamic instability and adverse events were noted and the results were statistically analyzed, considering a P value of < 0.05 to be statistically significant.

Results: The time of onset of sensory block in Group RP was of 6.7±0.51 minutes and in Group RB was of 4.533±0.57 minutes.The sensory block lasted for 334.33±15.01 minutes in Group RP and 606.17±88.29 minutes in Group RB. The onset of motor

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE02, 2024

block in Group RP was 9.3±0.53 minutes and in Group RB was 6.1±0.54 minutes. The motor block lasted for 228.67±11.958 minutes in Group RP and 517.67±103.94 minutes in Group RB. The duration of analgesia in Group RP was 317.50±15.578 minutes and in Group RB was 687.83±19.059 minutes. There was statistically significant difference found between two groups with respect to onset of sensory and motor blockade, duration of sensory and motor blockade and duration of analgesia (with P value <0.001). None of the patients had any other complications in either group.

Interpretation and Conclusion: Hence 0.75% Ropivacaine with buprenorphine 75mcg produced satisfactory sensory and motor blockade and also prolonged duration of analgesia when used for supraclavicular brachial plexus block under ultrasound guidance.

Keywords: Ropivacaine, buprenorphine, ultrasound guidance, supraclavicular brachial plexus block

Introduction

Pain is "An unpleasant sensory or emotional experience associated with actual or potential tissue damage or described in terms of such damage". It is an unpleasant effect associated with significant psychological and physiological changes during surgery and post-operative period [1].

Supraclavicular brachial plexus block is indicated for analgesia or anaesthesia for arm or hand surgeries. The tradition kulenkampff's technique is not in use anymore since the introduction of ultrasound guided sonography in 1980, because of high incidence of pneumothorax. Supraclavicular brachial plexus block is one of the important procedures, it blocks the nerve for hand surgeries i.e., upper arm, middle arm and hand surgeries with multiple injection with nerve stimulation but after the usage of ultrasound imaging technique, the anesthesiologist is able to secure the exact location of the needle and to give the block using the minimum dose of the drug and also avoiding the tissue or nerve damage. Ultrasound guided supraclavicular brachial plexus block is ideal for upper limb surgical procedure.

Supraclavicular brachial plexus approach is preferred for its rapid onset, reliable anaesthesia and as a safe technique for any surgery in the upper extremity that does not involve the shoulder[1].

Regional anaesthesia technique provide important advantages over general anaesthesia such as, excellent pain control, reduced side effects[2]. Blocking of supraclavicular brachial plexus during upper limb surgeries was found to be very effective in producing anaesthesia and analgesia. This type of peripheral nerve block provide intraoperative and post-operative analgesia without any systemic side effects.

Supraclavicular brachial plexus block has been proved to be superior alternative to general anaesthesia for upper limb surgeries and also for the provision of post-operative pain relief. Decreased hospital stay, less financial burden and avoidance of complications due to general anaesthesia are the main advantages of brachial plexus block. Brachial plexus block is the most popular technique to deal with the upper limb surgeries[3].There are many approaches followed to achieve this block[3].

1. Supraclavicular block.
2. Infraclavicular block.

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE02, 2024

3. Interscalene block.
4. Axillary block.

Various techniques used to perform supraclavicular brachial plexus block are

1. Conventional paresthesia technique.
2. Peripheral nerve stimulator guided.
3. Ultrasound guided (which is presently in use).

But amongst all of these, the supraclavicular approach to achieve the brachial plexus block is the easiest technique and consistent method for anaesthesia in surgeries below the shoulder joint[3]. The supraclavicular and infraclavicular approaches are associated with the greatest diffusion of local anaesthetic solution after a single injection because, at these level the brachial plexus is most compact.

Materials and Method

The present study "A comparative clinical study between 0.75% Ropivacaine versus 0.75%Ropivacaine with Buprenorphine for supraclavicular brachial plexus block under ultrasound guidance", was carried out on patients undergoing elective upper limb surgeries at A.I.M.S., Department of Anaesthesiology, for a period of 18 months.

After obtaining permission from the ethical committee of the institution, those patients who fulfill the inclusion criteria were enrolled for the purpose of study and informed written consent was obtained.

A prospective randomized double blind study was carried out on sixty patients of ASA 1 and ASA 2 physical status aged between 25 to 60 years undergoing elective upper limb surgeries under ultrasound guided supraclavicular brachial plexus block. Patients were divided into two groups by computer generated randomization chart and sealed envelop technique.

1. Group RP- Ropivacaine +Placebo (Normal saline), received Ropivacaine 0.75% 19 ml + Normal saline 1ml.
2. Group RB- Ropivacaine +Buprenorphine, received Ropivacaine0.75% 19 ml + Buprenorphine (75mcg) (diluted to 1ml with normal saline).

Inclusion criteria

- Age group 25 to 60 years.
- ASA I and II physical status.
- Patients with body weight 50-75kg.
- Informed consent of adults.

Exclusion criteria

- Patients unwillingness for giving informed consent.
- Unco-operative patient.
- Local pathology at the site of block [example-infection, cellulitis].
- History of allergy, convulsion, neurological defects and any bleeding disorders.
- Systemic illness like cardiac, respiratory, hepatic, renal failure.
- Patients who are above the age of 60 years.
- Pregnant and lactating mothers.

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE02, 2024

Results

This section of the study is devoted for the presentation of results. The researcher has described the demographic profile of the patients at the beginning of this section. Though the researcher did not find any statistically significant differences (p>0.05) in the demographic characteristics of the patients in two groups, yet a description of few of them provides an insight into the background characteristics and enables standardization of the subjects.

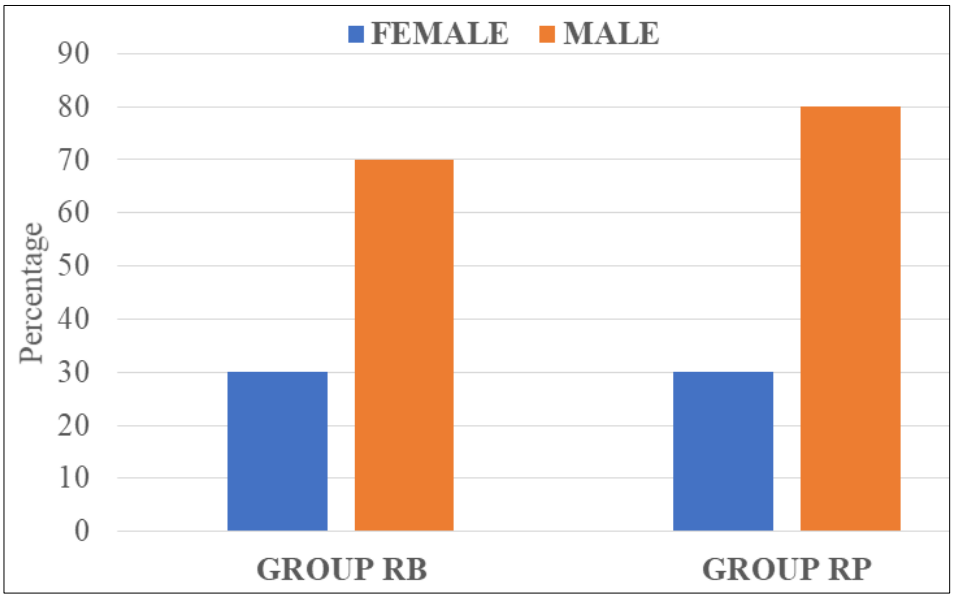
Gender wise distribution of the research subjects

Gender is one of the important variables in the clinical studies, and in this study, the data clearly showed a preponderance of male population in the both groups. But, the gender difference in the study subjects was not statistically significant.

Table 1: Distribution of subjects according to gender among the groups

	Group		Total
	RB	RP	
Female	9	9	18
	30.0%	30.0%	30.0%
Male	21	21	42
	70.0%	70.0%	70.0%
Total	30	30	60
	100.0%	100.0%	100.0%

P Value 1.00, there was no statistically significant difference found between two groups with respect to gender



Graph 1: Graph showing Distribution of subjects according to gender among the groups

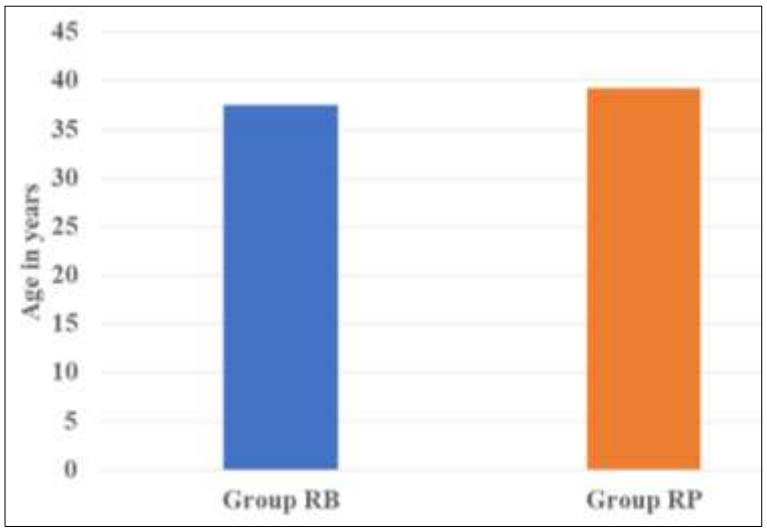
ISSN: 0975-3583, 0976-2833 VOL15, ISSUE02, 2024

Age wise distribution of the research subjects

Table 2: Comparison of mean age between two groups

	Mean	Std. Deviation	P Value
Group RB	37.50	11.346	0.519
Group RP	39.23	9.220	

In group RB Mean age was 37.5+11.34yrs. In group RP Mean age was 39.23+9.2yrs. There was no statistically significant difference found between two groups with respect to age.



Graph 2: Graph showing Comparison of mean age between two groups

Beginning of surgery after block

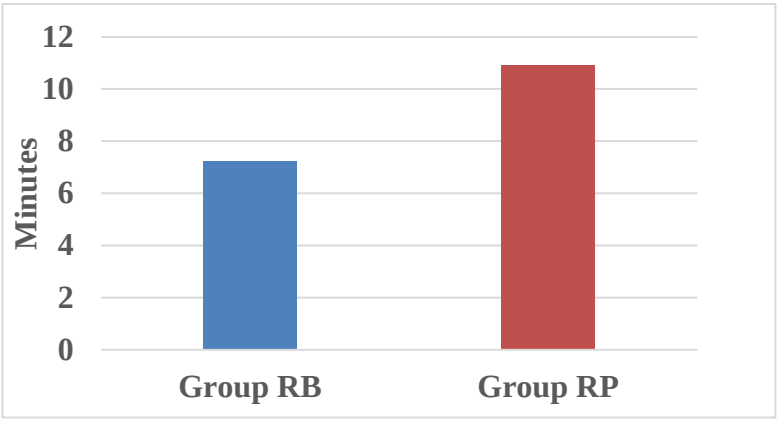
Table 3:- Comparison of mean beginning of surgery after the block between two groups

	Mean	Std. Deviation	P Value
Group RB	7.23	.774	<0.001
Group RP	10.90	.759	

There was a statistically significant difference found between two groups with respect to beginning of surgery after the block. Indirectly indicates that the complete motor and sensory blockade was faster in Group RB.

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE02, 2024

Graph3:- Graph showing Comparison of mean beginning of surgery after the block between two groups.



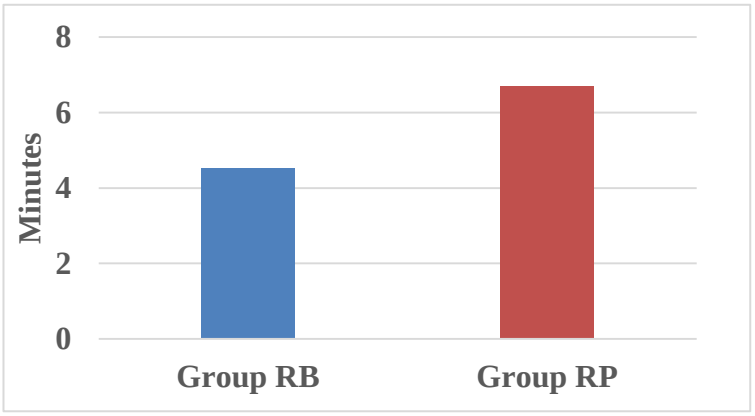
Onset of sensory block

Table 4:- Comparison of mean onset of sensory block between two groups

	Mean	Std. Deviation	P Value
Group RB	4.533	.5713	<0.001
Group RP	6.700	.5186	

There was a statistically significant difference found between two groups with respect to mean onset of sensory block. Onset of sensory block was faster in Group RB

Graph4:- Graph showing Comparison of mean onset of sensory block between two groups.



ISSN: 0975-3583, 0976-2833 VOL15, ISSUE02, 2024

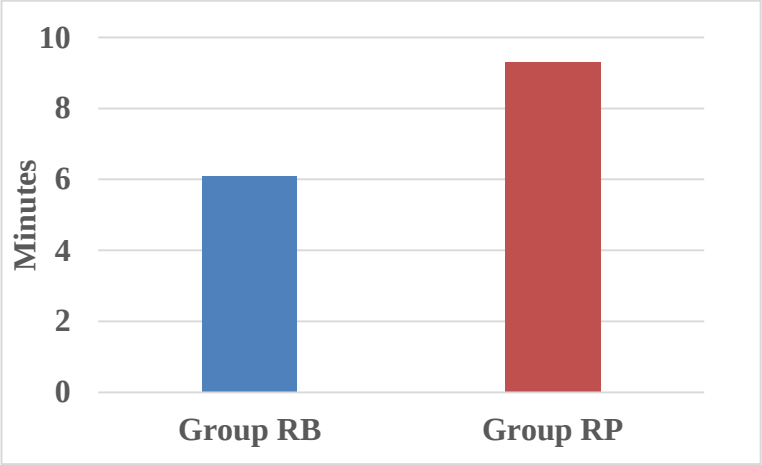
Onset of motor block

Table 5:- Comparison of mean onset of motor block between two groups

	Mean	Std. Deviation	P Value
Group RB	6.10	.548	<0.001
Group RP	9.30	.535	

There was a statistically significant difference found between two groups with respect to mean onset of motor block. Onset of motor block was faster in Group RB.

Graph5:- Graph showing Comparison of mean onset of motor block between two groups.



Duration of sensory block

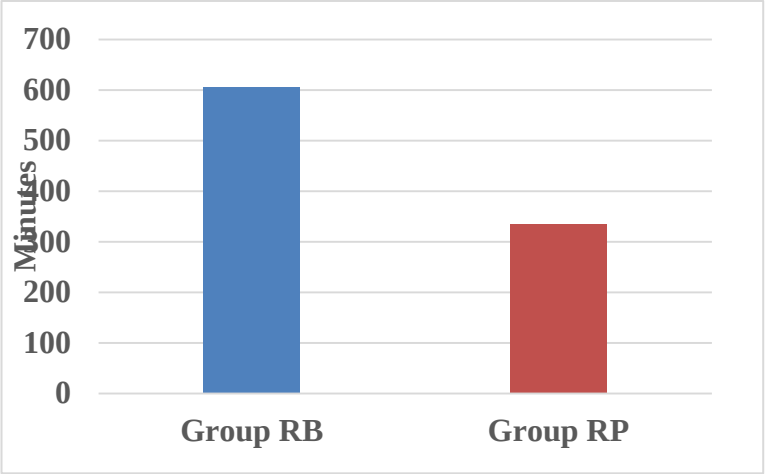
Table 6:- Comparison of mean duration of sensory block between two groups

	Mean	Std. Deviation	P Value
Group RB	606.17	88.295	<0.001
Group RP	334.33	15.013	

There was a statistically significant difference found between two groups with respect to duration of sensory block. Duration of sensory block was more in Group RB.

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE02, 2024

Graph6:- Graph showing Comparison of mean duration of sensory block between two groups.



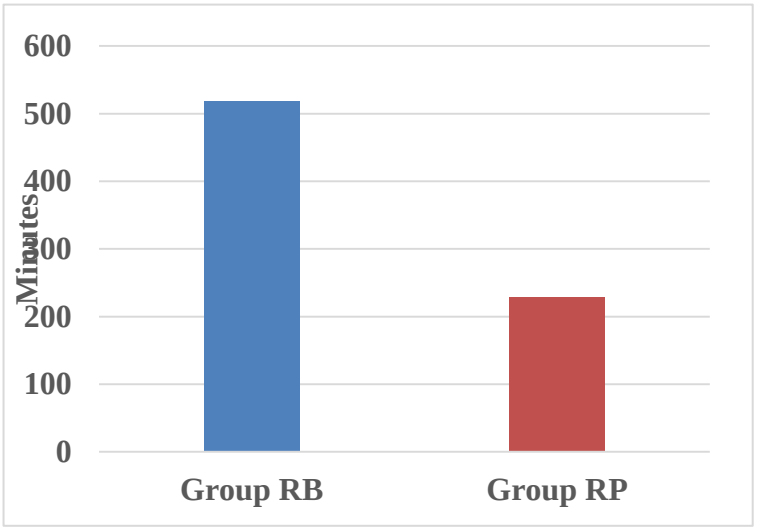
Duration of motor block

Table 7:- Comparison of mean duration of motor block between two groups

	Mean	Std. Deviation	P Value
Group RB	517.67	103.946	<0.001
Group RP	228.67	11.958	

There was a statistically significant difference found between two groups with respect to duration of motor block. Duration of motor block was more in Group RB.

Graph7:- Graph showing Comparison of mean duration of motor block between two groups.



ISSN: 0975-3583, 0976-2833 VOL15, ISSUE02, 2024

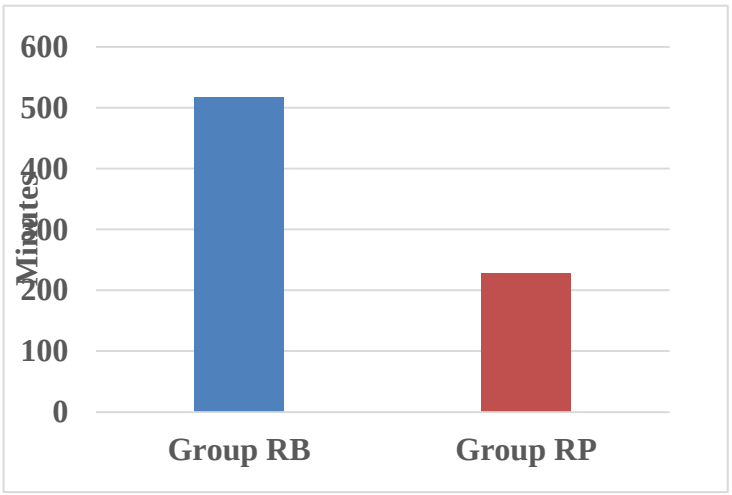
Duration of analgesia

Table 8:- Comparison of mean duration of analgesia between two groups

	Mean	Std. Deviation	P Value
Group RB	687.83	19.059	<0.001
Group RP	317.50	15.578	

There was a statistically significant difference found between two groups with respect to duration of analgesia. Duration of analgesia was more in Group RB.

Graph 8:- Graph showing Comparison of mean duration of analgesia between two groups.



Discussion

This section of the study is devoted for the discussion of the present clinical study entitled "A comparative clinical study between 0.75% Ropivacaine versus 0.75% Ropivacaine with Buprenorphine for supraclavicular brachial plexus block under ultrasound guidance", conducted in department of anaesthesiology, Adichunchanagiri Institute of Medical Sciences, B.G. Nagara, Mandya, to evaluate and compare the effects of addition of Buprenorphine with Ropivacaine and Ropivacaine alone for supraclavicular brachial plexus block using ultrasound, with reference to objectives.

After obtaining permission from the ethical committee of the institution and written informed consent, sixty patients aged between 25 to 60 years belonging to ASA physical status 1 and 2, undergoing elective upper limb surgeries under ultrasound guided supraclavicular brachial plexus block were randomly allocated to two groups of thirty each, to receive either Ropivacaine 0.75% 19ml + Normal saline 1ml (group RP) or Ropivacaine 0.75% 19ml + Buprenorphine 75mcg (diluted to 1ml with normal saline) (group RB). All the patients were administered ultrasound guided supraclavicular brachial plexus block under aseptic precautions using the study drugs and various parameters were studied.

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE02, 2024

Hypothesis made before starting the study

The duration of action after single injection is limited when local anaesthetic alone is used and to prolong its effect, wide range of additives have been used in combination with local anesthetics to promote analgesia. This led us to use opioid agent Buprenorphine along with Ropivacaine.

Results from our study shows that the time of onset of sensory block in Group RP was of 6.7±0.51 minutes and in Group RB was of 4.533±0.57 minutes. The sensory block lasted for 334.33±15.01 minutes in Group RP and 606.17±88.29 minutes in Group RB. The onset of motor block in Group RP was 9.3±0.53 minutes and in Group RB was 6.1±0.54 minutes. The motor block lasted for 228.67±11.958 minutes in Group RP and 517.67±103.94 minutes in Group RB. The duration of analgesia in Group RP was 317.50±15.578 minutes and in Group RB was 687.83±19.059 minutes. There was statistically significant difference found between two groups with respect to onset of sensory and motor blockade, duration of sensory and motor blockade and duration of analgesia (with P value <0.001). None of the patients had any other complications in either group

Conclusion

From the present study entitled "A comparative clinical study between 0.75% Ropivacaine versus 0.75% Ropivacaine with Buprenorphine for supraclavicular brachial plexus block under ultrasound guidance", it can be concluded that,

1. There is statistical significant difference in the time of onset of sensory blockade between 0.75% Ropivacaine 19ml + 1ml Normal saline and 0.75% Ropivacaine 19ml + 1ml (75mcg) buprenorphine.
2. There is statistical significant difference in the time of onset ofmotor blockade.
3. There was a statistically significant difference found between two groups with respect to duration of sensory block.
4. There was a statistically significant difference found between two groups with respect to duration of motor block.
5. There was a statistically significant difference found between two groups with respect to duration of analgesia.

Hence 0.75% Ropivacaine with Buprenorphine 75mcg produces satisfactory sensory and motor blockade and also prolonged duration of analgesia when used for supraclavicular brachial plexus block under ultrasound guidance. Accidental intravascular injection of local anaesthetic drug and occurrence of adverse events like local anaesthetic toxicity might be worrisome complications even though incidence is less, particularly when larger volumes of local anaesthetic like 25ml or more are used, as is being followed conventionally. Using 19ml of 0.75% Ropivacaine may reduce the incidence of these complications by decreasing the total dose of local anaesthetic the patient is exposed to and thus carries a better safety margin, with the added advantage of cost effectiveness.

Hence it has been concluded from the present study that addition of adjuvant prolongs the duration of analgesia significantly with no side effects or complications.

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE02, 2024

References

1. Prasad JR, Farooq Basha S. Comparative study of Ropivacaine alone versus ropivacaine with dexmedetomidine in supraclavicular brachial plexus block. J Evolution Med. Dent. Sci. 2016Jan 11;5(03):233.eISSN-2278-4802, pISSN-2278-4748.
2. Introduction to Ultrasound-Guided Regional Anaesthesia-NYSORA the New York School of Regional Anaesthesia. Based on Hadzic's Textbook of RAPM 2nd Ed;c2017 (https://goo.gl/gVLhna).
3. Sahi P, Kumar R, Sethi C, Gupta N, Singh A, Prashastisaxena. Comparative Evaluation of the effects of Fentanyl and Dexmedetomidine as an Adjuvants in Supraclavicular Brachial Plexus Block Achieved with Ropivacaine. International Journal of Contemporary Medical Research, 2018 Feb, 83(1). ISSN: 2393-915X; (Print): 2454-7379 ICU:77.
4. Vincent WS, Chan MD, Anahi Perlas MD, Regan Rawsen RN, Olusegun Odukoya MD. Ultrasound-guided Supraclavicular Brachial Plexus Block. Regional anaesthesia, section editor, Denise J Wedel, Anesth. Analog. 2003;97:1514-1517.
5. Macfarlane A, Brull R. Ultrasound guided supraclavicular block. The journal of the New York school of regional anesthesia.2009;12:6-10. (WWW.NYSORA.COM).
6. Ultrasound for Regional Anesthesia (http://www.usra.ca/ra.php supraclavicular block).
7. Kessler J, Gray AT. Ultrasound guidance for regional anaesthesia. In: Miller RD, Cohen NH, Eriksson LI, Fleisher LA, Wiener-kronish JP, Young WL, editors. Miller's anarsthesia. 8th ed. Philadelphia: Elsevier Saunders; c2019.
8. Collins VJ. Local anesthetics, Toxicological basis for local anaesthetic reaction spinal anaesthesia principles. In: Principles of Anaesthesiology general and regional anaesthesia. 3rd Ed. Philaedelphia: Lea and Febiger; c1993. p. 1232-1281, 1291-1301, 1445-1497.
9. Berde CB, Strichartz GR. Local anaesthetics. In: Miller RD, Cohen NH, Eriksson LI, Fleisher LA, Wiener-Kronish JP, Young WL, editors. Miller's anaesthesia. 9th ed. Chapter 29;c2019.
10. Stoelting RK, Hiller SC. Local anaesthetics. In: Pharmacology and Physiology in Anaesthetic Practice. 4th ed. Philadelphea: Lippincott Williams and Wilkins; c2006.p.179-209.