



A Comparative Clinical Study of Levobupivacaine (0.5%) and Ropivacaine (0.5%) for Supraclavicular Brachial Plexus Block

Authors

Dr Vikas Kumar Singh¹, Dr Rakesh Kumar Singh²

¹Junior resident, Department of Anaesthesiology, KMC, Katihar, India

²Professor, Department of Anaesthesiology, KMC, Katihar, India

Abstract

Introduction: Brachial plexus block technique has recently become popular as it is cost effective, better postoperative recovery, preserves CNS function, devoid of side effects of laryngoscopy and systemic hemodynamic changes. Present study was undertaken to compare the 0.5% LEVOBUPIVACAINE and 0.5% ROPIVACAINE in terms of onset of action, duration of action and post operative analgesia in supraclavicular brachial plexus block.

Methods: The study was a prospective, randomized, double blind comparative study which includes 40 patients with ASA grade I & II of either sex, between the ages 18 years to 60 years going for upper limb surgery. cases was divided randomly into two groups: Group L: receive Inj. levobupivacaine hydrochloride 0.5% 25cc and Group R: Receive Inj. ropivacaine hydrochloride 0.5% 25cc. Each individual was allocated to respective group by computer generated randomization chart. The onset of sensory & motor block, duration of action and duration of post operative analgesia were recorded and compare for both groups.

Results: In present study it is observed that the onset of sensory blockade ($p= 0.56$) & motor blockade ($p= 0.54$) was comparable in both the groups with prolong duration of sensory & motor blockade ($p= 0.000$) in group L as compare to group R. The time for first rescue analgesia required post operatively was longer in group L as compare to group R and the difference is significant ($p=0.000$). The systolic blood pressure, diastolic blood pressure & heart rate were comparable in both the groups.

Conclusion: The onset of sensory and motor blockade was comparable in both drugs with prolong duration of action and requires lesser dose of rescue analgesic in 0.5% levobupivacaine as compare to 0.5% ropivacaine in supraclavicular brachial plexus block.

Introduction

Brachial plexus block technique has recently become popular against general anaesthesia as it is cost effective, better postoperative recovery, preserves CNS function, devoid of side effects of laryngoscopy, muscle relaxants and systemic haemodynamic changes. This type of anaesthesia is advantageous in case of prolonged orthopedic, plastic reconstructive surgeries and in emergency surgeries where the patients are full stomach and in high risk patients. This technique not only

provides anaesthesia but also provide post-operative analgesia¹.

In present day practice nerve locators with ultrasound guidance technique is being used for proper nerve localization and optimal needle placement thus minimising unpleasant paresthesia and also reducing any incidence of neural damage, with higher rate of block success and faster onset times.^{2,3}

Variety of local anaesthetic drugs are used, among them Bupivacaine is most commonly used drugs

for brachial plexus block but at high dose may lead to cardiotoxicity and neurotoxicity. Ropivacaine, the S- enantiomer of S-1-propyl-2'6'- pipercoloxylidide is an amino-amide local anaesthetic with chemical structure similar to that of bupivacaine. Ropivacaine produced less cardiac and CNS toxicity. Levobupivacaine the S (-) enantiomers- of bupivacaine is the latest local anaesthetic agent introduced into clinical practice and has less cardiotoxic and neurotoxic effects than bupivacaine.

There are four common approaches to the brachial plexus block- the interscalene, supraclavicular, infraclavicular, and axillary approach. Among these approaches, the supraclavicular approach is associated with a rapid onset of anaesthesia and a high success rate^{4 5} along with complications like pneumothorax, ipsilateral phrenic nerve palsy, Horner syndrome and recurrent laryngeal nerve palsy.

Aims and Objectives

Primary aim of the study was to compare the onset of motor and sensory blockade of 0.5% Levobupivacaine and 0.5% Ropivacaine with the **Secondary Aim** to compare the duration of action & duration of post-operative analgesia of 0.5% Levobupivacaine with 0.5% Ropivacaine.

Materials and Methods

Study Design and Sample Size

The study was a prospective, randomized, double blind, comparative study done at Department of Anaesthesiology, KMC Hospital, Katihar from Feb - 2019 to Jan - 2020 which included 40 patients with ASA grade I & II of either sex, between the ages 18 to 60 years who underwent upper limb surgeries, having exclusion criteria of Patients not giving consent, existence of peripheral neuropathy, bleeding disorders, local cutaneous infections, pregnant and lactating mothers, hypersensitivity to either of the drugs, emergency surgical conditions, psychological patients that do not have the ability to feel and elaborate the pain.

After obtaining approval from institutional ethics committee and informed consent from patients, patients were divided randomly into two groups using computer generated randomization sequence, in that Group L (n=20) received Inj. levobupivacaine hydrochloride 0.5% 25cc and Group R (n=20) received Inj. ropivacaine hydrochloride 0.5% 25cc. Sensory blockade were assessed by touching the corresponding dermatomes with blunt end of a 26 gauge needle and motor blockade were assessed by asking patients to move the thumb.

Blockade Grading

GRADE	MOTOR BLOCKADE	SENSORY BLOCKADE
0	No blockade - able to touch pulp of little finger with pulp of thumb	No blockade - No sensory loss over C5-T1 dermatomes when assessed with blunt end of 26 gauge needle
1	Partial blockade- able to touch pulp of index finger with pulp of thumb.	Partial blockade- patient feels touch but no pain on pinprick
2	Complete blockade/lateral pinch (able to approximate thumb to lateral aspect of index finger)	Complete blockade- patient do not feel touch or pin prick.

Postoperatively, pain were assessed using the numeric rating scale (NRS), according to which “0” represented no pain and “10” meant worst possible pain. Post operatively, when NRS were equal to or more than 4, Inj. Tramadol hydrochloride 100 mg IM were given as rescue analgesic.

Statistical Analysis

An unpaired t- test were used to compare the onset and duration of sensory and motor block, pain score by NRS, rescue analgesic requirement between two groups. A p- value of <0.05 were consider as statistical significant.

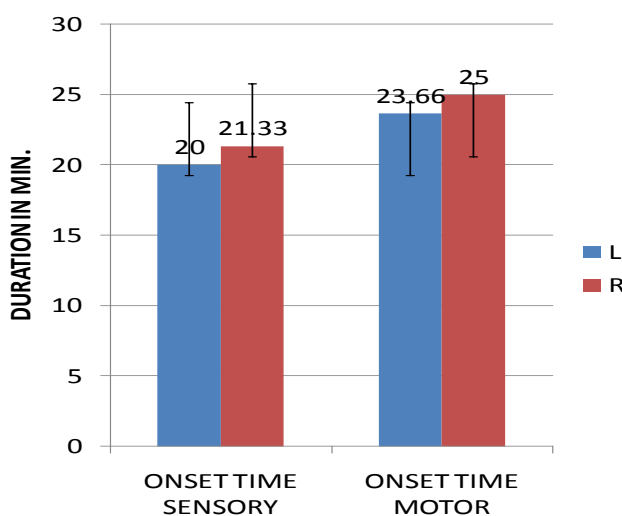
Results

1) Group L & Group R were comparable with regard to age, sex distribution, weight, height & duration of surgery so no statistical significant difference were found with regard to these parameters.

PARAMETER	GROUP- L	GROUP- R	p - VALUE
AGE	34.333 ± 12.232	34.533± 10.232	0.681
MALE : FEMALE	10 : 10	12 : 8	0.673
WEIGHT	61.865± 10.835	58.733±8.311	0.215
HEIGHT	161.80 ± 8.96	160.90 ± 6.43	0.792
ASA - GRADE (I : II)	12 : 8	14 : 6	0.660
DURATION OF SURGERY	2.00 ± 0.54	2.12±0.72	0.421

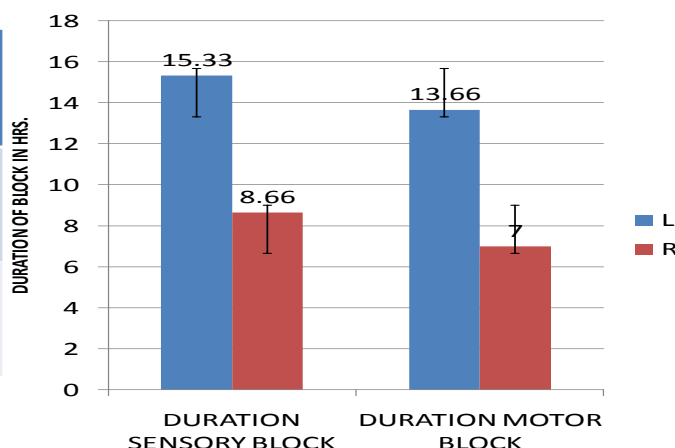
2) Onset of sensory (p=0.56) and motor (p=0.54) blockade in group - L (20.00 min.), (23.666 min.) Is comparable with group- R (21.333min.), (25.000min.) & difference was not significant.

DURAT-ION IN MIN.	GROUP L (MEAN± SD)	GROUP R (MEAN± SD)	p- VALUE
SENSORY BLOCK	20.000 ± 2.000	21.333 ± 3.055	0.56
MOTOR BLOCK	23.666 ± 2.516	25.000 ± 2.645	0.54



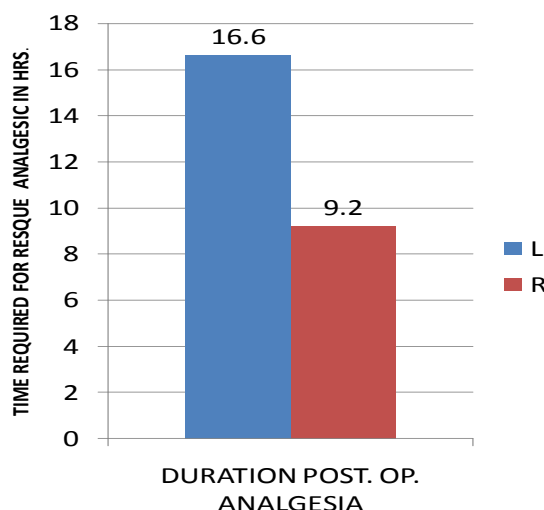
3) Duration of sensory and motor blockade was longer in group- L as compare to group- R & the difference was significant.

DURATION IN HRS.	GROUP L (MEAN ± SD)	GROUP R (MEAN ± SD)	P VALUE
SENSORY BLOCK	15.333 ± 0.577	8.666 ± 0.577	0.000
MOTOR BLOCK	13.666 ± 0.577	7.000 ± 1.000	0.000



4) Time for first rescue analgesic required post operatively was much longer in group L (16.6 hours) as compare to group R (9.2 hours) and the difference was significant (p=0.000)

	GROUP L (MEAN ± SD)	GROUP R (MEAN ± SD)	P VALUE
TIME OF FIRST RESQUE ANALGESIC REQUIRED	16.600 ± 2.190	9.200 ± 0.836	0.000



Discussion

Among various types of brachial plexus block the supraclavicular approach has been considered the most efficacious. It is often described as "spinal anaesthesia for upper extremity" because of its ubiquitous application for upper extremity surgery characteristically associated with a rapid onset of anaesthesia, high success rate, complete and predictable anaesthesia for upper extremity.

In the present study, classical approach technique of supraclavicular brachial plexus block with the

aid of a nerve stimulator was used. The study drug was injected when flexion movement was seen at the fingers. In our study, none of the patients developed any feature of cardiovascular or central nervous system toxicity, did not received general anaesthesia or sedation before administration of block and not complained about incomplete action or failure of technique.

In this study the onset of motor and sensory blockade were found comparable, in different

study Nodulas et al found the similar result with 0.5% Levobupivacaine and 0.5% ropivacaine⁸ .

In this study, the duration of analgesia provided by levobupivacaine was longer than that of ropivacaine. A different study by Cox and colleagues⁶ examining the difference between levobupivacaine and bupivacaine for axillary brachial plexus block, found similar results the duration of analgesia of levobupivacaine in our study was 996 minutes compared with 1039 minute found by Cox et al.⁶ The duration of analgesia provided by ropivacaine in our study was 552 minute as compare to 430 minutes in the study of McGlade et al⁷ .

In our study duration of motor blockade for levobupivacaine was 820 minute which was slightly shorter than the duration of analgesia of 996 minutes, in contrast to the study of Cox et al who found that the duration of motor blockade for levobupivacaine was 1050 minutes,⁶ in our study the duration of motor blockade for ropivacaine was 420 minute which was shorter than duration of analgesia of 552 minute, this in contrast with the study by Mc Glade et al⁷ who found it nearly identical.

Conclusion

The onset of sensory and motor blockade were comparable in both drugs with prolong duration of action and requires lesser dose of rescue analgesic in 0.5% levobupivacaine as compare to 0.5% ropivacaine in supraclavicular brachial plexus block.

References

1. Damien B, Murhy, Collin JL, Cartney, Vincent WS. Novel analgesic adjuvants for brachial plexus block: A Systemic review. *Anesth Analg*. 2000;90:1122-8.
2. Abrahams MS, Aziz MF, Fu RF, Horn JL. Ultrasound guidance compared with electrical neurostimulation for peripheral nerve block: A systematic review and

metaanalysis of randomized controlled trials. *Br J Anaesth*. 2009;102:408-17.

3. Williams SR, Chouinard P, Arcand G, Harris P, Ruel M, Boudreault D, et al. Ultrasound guidance speeds execution and improves the quality of supraclavicular block. *Anesth Analg*. 2003;97(5):1518-23.
4. Heid FM, Jage J, Guth M, Bauwe N, Brambrink AM. Efficacy of vertical infraclavicular plexus block vs. modified axillary plexus block: a prospective, randomized, observer-blinded study. *Acta Anaesthesiol Scand*. 2005;49:677-82.
5. Hadzic A, Vloka JD. Infraclavicular brachial plexus block. *New York School of Regional Anesthesia* [internet]. www.nysora.com Brachial Plexus Anatomy – Human Anatomy [Internet]. [cited 2016 Jul 22].
6. Cox CR, Checketts MR, Mackenzie N, Scott NB, Banister J, Comparison of S (-) bupivacaine with racemic (RS) bupivacaine in supraclavicular brachial plexus block. *Br J Anaesth* 1998; 80:594-598.
7. McGlade DP, Kalpokas MV, Mooney PH, Chamley D, Mark AH. A comparison of 0.5% ropivacaine and 0.5% bupivacaine for axillary brachial plexus anaesthesia. *Anaesth Intensive Care*. 1998;26:515- 520.
8. Nodulas N, Kaliakmanis D, Graikiotis A, Kouvalakidou A. Comparison of Levobupivacaine 0.5% and Ropivacaine 0.5% for digital nerve block in ambulatory surgery. *European Journal of Anaesthesiology*. 2011;28:120.