

COMPARATIVE CLINICAL STUDY OF 0.5% ROPIVACAINE WITH CLONIDINE AND 0.5% LEVOBUPIVACAINE WITH CLONIDINE IN INFRACLAVICULAR BRACHIAL PLEXUS BLOCK FOR BELOW ELBOW SURGERY

Anaesthesiology

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ABSTRACT

Background:- Infraclavicular Brachial plexus block is superior over general anaesthesia for upper limb surgeries with better post-operative analgesia and fewer side effects. **Material And Method:-** In present study 60 patient of either sex, aged between 18 to 60 years belonging to ASA class I and II, scheduled for elective surgeries below elbow under Infraclavicular Brachial Plexus Block using Peripheral Nerve Stimulator [PNS]. Group LC (n = 30):- Received 0.5% Levobupivacaine 30 ml + Clonidine (75mcg). Group RC (n = 30):- Received 0.5% Ropivacaine 30 ml + Clonidine (75mcg). **Result:-** Onset of sensory blockade of LC group was 7.5±1.306 min and in RC group was 11.466±1.634 min. Onset of motor blockade was 11.133±1.502 min in LC group and 14.4±1.248 min in RC group. Duration of sensory blockade was 1003.833±65.898 min in LC group and 755.166±62.193 min in RC group. Duration of motor blockade was 955.333±68.969 min in LC group and 735.833±58.133 min in RC group and Duration of Analgesia was 1048±67.83 min in LC group and 813.166±64.667min in RC group. **Conclusion:-** Drug combination of 0.5% Levobupivacaine with Clonidine 75 mcg is more effective and better than the drug combination of 0.5% Ropivacaine with Clonidine for infraclavicular brachial plexus block for below elbow surgeries using PNS guidance.

KEYWORDS

Infraclavicular Block, Clonidine, Levobupivacaine, Ropivacaine

INTRODUCTION

Surgeries of the upper limb have traditionally been done under general anaesthesia. However this has its own demerits like airway instrumentation, exposure to multiple drugs and chances of aspiration if inadequate nil oral status.

The infraclavicular brachial plexus block with coracoids approach has gained popularity because of its consistent bony landmarks, less chances of vascular puncture and adequate neural blockade^[1]. It causes less discomfort to the patient as positioning of the arm is not required and there is a lower incidence of pneumothorax.^[4] Ropivacaine, the S-enantiomer of S-1-propyl-2, 6-pipecoloxylidide, is an amino-amide local anaesthetic with chemical structure similar to that of Bupivacaine. Ropivacaine has been shown to produce less cardiac and central nervous system toxic effects, less motor block and similar duration of sensory analgesia when compared to Bupivacaine^[4,5,6,7].

Levobupivacaine is an amide local anaesthetic. Levobupivacaine, the S-enantiomer of Bupivacaine, is the latest local anaesthetic agent introduced into clinical practice. It is less cardiotoxic compared to racemic Bupivacaine^[4,5,6,7].

Clonidine, a selective α_2 adrenergic agonist inhibits nociceptive impulses by activating postjunctional α_2 adrenoreceptors both at peripheral and spinal nerve endings. It improves block characteristics of LAs in peripheral nerve blocks without producing any side effects like sedation, bradycardia and hypotension as seen in spinal blocks^[8].

AIMS AND OBJECTIVES

The aim of the study was to comparative clinical study of 0.5% Ropivacaine 30ml with Clonidine 75mcg and 0.5% Levobupivacaine 30ml with Clonidine 75mcg in infraclavicular brachial plexus block for below elbow surgeries with Peripheral Nerve Stimulator (PNS) guidance.

This was done by following observations:

1. To compare the onset of sensory and motor blockade
2. To compare the duration of sensory and motor blockade.
3. To compare the duration of analgesia.
4. Peri-operative hemodynamic parameters
 - a) pulse rate
 - b) Systolic & diastolic blood pressure
 - c) SpO₂
5. Complications; if any.

MATERIALS AND METHODS

A clinical study entitled “ **Comparative clinical study of 0.5% Ropivacaine with Clonidine and 0.5% Levobupivacaine Clonidine in infraclavicular brachial plexus block for below elbow surgery**” was undertaken in Swaroop Rani Nehru Hospital associated with Moti Lal Nehru Medical college, Prayagraj during a period of one year after obtaining ethical committee clearance and informed and written consent from all patients.

Sixty patients posted for elective surgeries below elbow were included in the study. The study population was blinded and randomly divided into 2 groups with 30 patients in each group (n=30) using shuffled, closed, opaque envelope method.

(1) Group LC (n = 30):- Received 0.5% Levobupivacaine 30 ml + Clonidine (75mcg)

(2) Group RC (n = 30):- Received 0.5% Ropivacaine 30 ml + Clonidine (75mcg)

The anatomical landmarks were identified initially. Under aseptic precautions, skin wheal was raised with Lidocaine 2% at the site of block prior to block placement. The coracoid process was located, needle entry point was 2 cm medial and 2 cm caudal to the most prominent part of the coracoid process. After appropriate skin preparation, local anaesthetic was infiltrated at the needle insertion site. A 22 G 80 mm insulated short beveled needle was used. The needle was introduced vertically at the specific landmark and a nerve Stimulator with setting of a current of 2 mA and a frequency of 2 Hz was used. As the nerve was approached, movement of the wrist or fingers elicited was identified and the current was gradually reduced to 0.5 mA. The end point taken was when hand twitches could be elicited at a current of 0.5 mA. Once this was achieved, the local anesthetic was given in 5 ml increments, aspirating before each bolus to avoid intravascular injection. During the surgery haemodynamic variables like Heart rate, blood pressure, pulse oxygen saturation were monitored and recorded at 0 min, 15 min, 30 min, 60 min, 120 min or till the completion of surgery and after surgery at 1 hr, 2 hr, 4 hr, 8 hr, 12 hr, 24 hr.

DEFINITIONS OF STUDY PARAMETERS

Onset of sensory blockade: Assessed as loss of pin prick sensation using the blunt needle. in any of dermatomes C5 to T1. Sensory block was assessed by pin prick test using a 3-point scale:

0 = normal sensation

1 = loss of sensation of pin prick (analgesia)

2 = loss of sensation of touch (anesthesia)

Onset of motor blockade:- Onset time of motor blockade by loss of motor power in any of the dermatomes C₅-T₁.

Modified Bromage scale is 3-point scale:-

Grade 0: Normal motor function with full flexion and extension of elbow, wrist, and fingers

Grade 1: Decreased motor strength with ability to move the fingers only

Grade 2: Complete motor block with inability to move the fingers

Statistical Analysis:-the statistical data for comparison using student's unpaired t test The p value of <0.05 was considered significant.

OBSERVATIONS AND RESULTS

Table 1 :-Demographic Profile of patient

Variable	0.5% Levobupivacaine+ Clonidine (LC group)	0.5% Ropivacaine+ Clonidine (RC group)	P-value	Statistical analysis
Age (years)	38.966±8.676	41.7±10.382	0.2730	Not Significant
Sex (M/F)	20 (66.67%) / 10 (33.33%)	20 (66.67%) / 10 (33.33%)	1.000	Not Significant
Weight (kg)	62.466±8.846	62.133±6.621	0.8696	Not Significant
Height (cm)	161.966±5.346	163.4±5.660	0.3172	Not Significant
ASA	I-16; II-14	I-16; II-14	1.000	Not Significant

Table 2:- Onset and Maximum Sensory Blockade in minutes (Mean ± SD)

Sensory Blockade	0.5% Levobupivacaine+ Clonidine (LC group)	0.5% Ropivacaine+ Clonidine (RC group)	P-value	Statistical analysis
Onset of Sensory Blockade (min)	7.5±1.306	11.466±1.634	<0.0001	Highly Significant
Maximum Sensory Blockade (min)	11±1.531	15.4±1.610	<0.0001	Highly Significant

Onset of sensory block, in LC Group was 7.5±1.306 min whereas in RC group was 11.466±1.634 min, (P<0.0001). Maximum Sensory Blockade in LC group was 11±1.531 min whereas in RC group was 15.4±1.610 min (P value<0.0001).

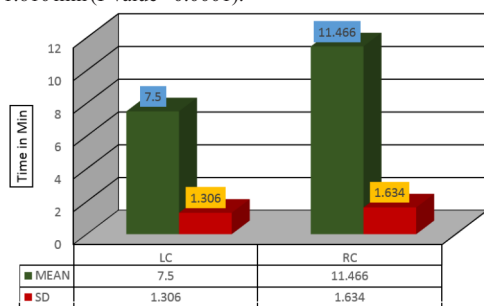


Fig 1:- Onset of Sensory Blockade in Study Population

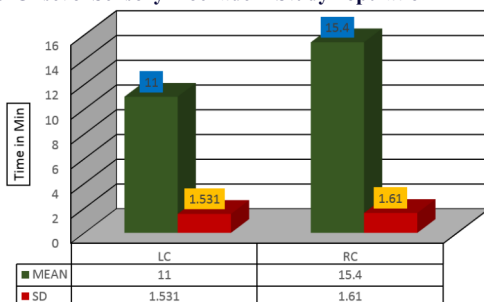


Fig 2:- Onset of Maximum Sensory Blockade in Study Population

Table 3: Onset and Maximum Motor Blockade in minutes (Mean ± SD)

Motor Blockade	0.5% Levobupivacaine+ Clonidine (LC group)	0.5% Ropivacaine+ Clonidine (RC group)	P-value	Statistical analysis
Onset of Motor Blockade (min)	11.133±1.502	14.4±1.248	<0.0001	Highly Significant
Maximum Motor Blockade (min)	14.166±1.416	17.4±1.003	<0.0001	Highly Significant

Onset of motor blockade is 11.133±1.502 min in LC group and 14.4±1.248 min in RC group. (P <0.0001). The complete motor blockade was achieved in 14.166±1.416 min in LC group and 17.4±1.003 min in RC group (p<0.0001).

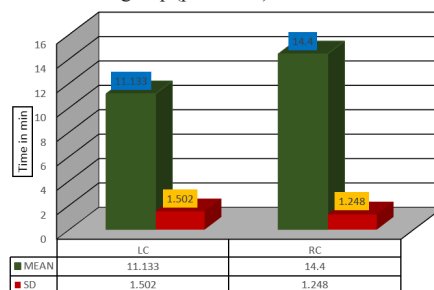


Fig 3:- Onset of Motor Blockade in Study Population

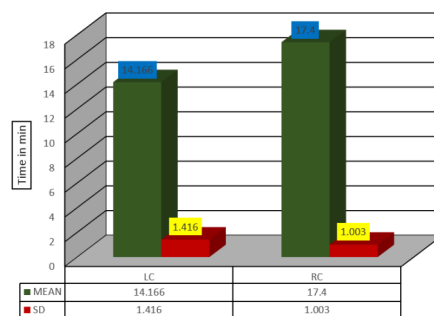


Fig 4:- Onset of Maximum Motor Blockade in Study Population

Table 4: Duration of Sensory and Motor Block and Analgesia in two groups (min) (Mean ± SD):-

Motor Blockade	Group LC	Group RC	P-value	Statistical analysis
Duration of motor block (min)	955.333±68.969	735.833±58.133	<0.0001	Highly Significant
Duration of sensory block (min)	1003.833±65.898	755.166±62.193	<0.0001	Highly Significant
Duration of analgesia (min)	1048±67.83	813.166±64.667	<0.0001	Highly Significant

Duration of motor blockade was 955.333±68.969 min in LC group and 735.833±58.133 min in RC group (P < 0.0001). Duration of sensory blockade was 1003.833±65.898 min in LC group and 755.166±62.193 min in RC group (P<0.0001).

Duration of Analgesia was 1048±67.83 min in LC group and 813.166±64.667min in RC group (P value<0.0001).

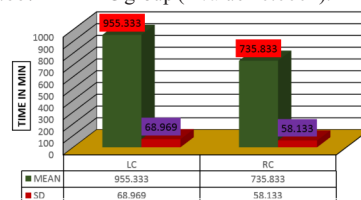


Fig 5:- Duration of Motor Blockade in Study Population

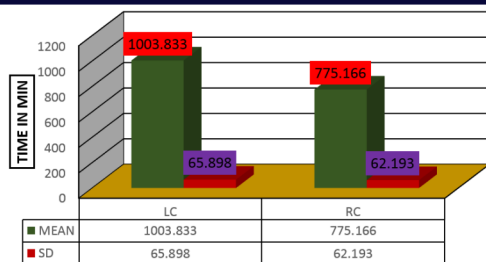


Fig 6:- Duration of Sensory Blockade in Study Population

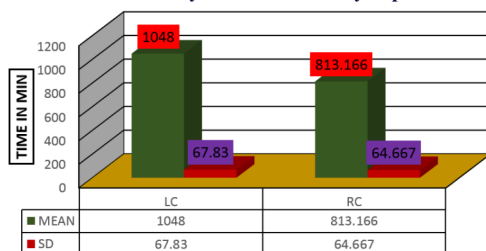


Fig 7:- Duration of Analgesia in Study Population

Table 6:- Mean & SD Blood Pressure:-

Blood pressure	Group LC S.B.P	Group RC S.B.P	P Value	Group LC D.B.P	Group RC D.B.P	P value	Statistical Analysis
PRE-OP VITALS							
	136.4±10.549	134.133±8.353	0.3599	82.733±8.02	80.266±5.84	0.1787	Not Significant
INTRA-OP VITALS							
0 Min	133.33±9.646	133.8±8.343	0.8407	82.1±7.37	80.1±6.64	0.2740	Not Significant
15 Min	133.93±10.70	132.866±8.148	0.6668	81.4±7.37	80±4.93	0.3907	Not Significant
30 Min	134±11	132±8.5	0.4339	80.4±7.45	80±4.982	0.8078	Not Significant
60 Min	134±11	133±7.9	0.6874	81±8.081	80.66±5.181	0.8495	Not Significant
120 Min	135±11	134±7.7	0.6848	81.8±8.409	80.06±5.883	0.3586	Not Significant
POST-OP VITALS							
1 Hrs	132±9.2	133±7.8	0.6514	81.4±7.632	80.4±5.543	0.5637	Not Significant
2 Hrs	135±11	134±7.8	0.6861	81.66±7.241	80.533±6.05	0.5135	Not Significant
4 Hrs	135±10	134±7.6	0.6644	81.6±6.896	80.266±5.69	0.4174	Not Significant
8 Hrs	135±10	134±7.7	0.3890	80.66±7.813	80.8±5.523	0.9391	Not Significant
12 Hrs	135±10	131±6.9	0.0765	81.26±6.977	80.8±5.767	0.7790	Not Significant
24 Hrs	136±10	133±7	0.1868	81.66±7.59	80.866±5.55	0.6431	Not Significant

Table 7: Comparison of mean values of Oxygen Saturation(%):-

Duration	Group LC	Group RC	P-value	Statistical Analysis
PRE-OP VITALS				
	98±0.525	98.22±0.492	0.0994	Not Significant
INTRA-OP VITALS				
0 min	98.533±0.860	98.466±2.096	0.871	Not Significant
15 min	98.766±0.727	98.633±0.927	0.5388	Not Significant
30 min	98.433±0.773	98.466±0.730	0.8668	Not Significant
60 min	98.666±0.802	98.666±0.802	1.0000	Not Significant
120 min	98.566±0.897	98.6±0.813	0.8783	Not Significant
POST – OP VITALS				
1 hr	98.433±0.678	98.433±0.678	1.0000	Not Significant
2 hr	98.6±0.813	98.633±0.718	0.8682	Not Significant
4 hr	98.666±0.711	98.8±0.761	0.4838	Not Significant
8 hr	98.4±0.674	98.533±0.681	0.4503	Not Significant
12 hr	98.6±0.813	98.833±0.746	0.2522	Not Significant
24 hr	98±0.7	98±0.6	1.0000	Not Significant

DISCUSSION

Onset and maximum sensory blockade, Onset and Maximum Motor Blockade, Duration of Sensory and Motor Blockade and Duration of Analgesia in min (Table 2,3,4):-

Onset of sensory block in LC Group was 7.5±1.306 min whereas in RC group was 11.466±1.634 min, (P<0.0001). whereas time taken for maximum sensory blockade in LC group was 11±1.531 min whereas in RC group was 15.4±1.610 min, (P <0.0001)

Onset of motor blockade was 11.133±1.502 min in LC group and 14.4±1.248 min in RC group. (P <0.0001). The complete motor blockade was achieved in 14.166±1.416 min in LC group and 17.4 ±1.003 min in RC group. (p<0.0001).

Comparison of vitals :-

Table 5: Comparison of MEAN & SD values of Heart Rate:-

Duration	Group LC	Group RC	P-value	Statistical analysis
PRE - OP VITALS				
	79.4±5.041	83.666±5.773	0.3172	Not Significant
INTRA - OP VITALS				
0 min	79.533±4.861	82.133±5.981	0.0697	Not Significant
15 min	80.133±4.703	82.566±6.055	0.0875	Not Significant
30 min	79.4±5.334	81.866±5.348	0.0790	Not Significant
60 min	80.1±5.345	83.1±5.358	0.8528	Not Significant
120 min	81.6±5.481	81.466±5.544	0.9253	Not Significant
POST - OP VITALS				
1 hr	80±5.071	80.133±5.315	0.9214	Not Significant
2 hr	79.733±5.165	79.133±5.177	0.6548	Not Significant
4 hr	80.733±5.836	83.133±5.090	0.0950	Not Significant
8 hr	80.066±5.057	81.633±5.542	0.2573	Not Significant
12 hr	80.033±4.604	80.966±5.696	0.4878	Not Significant
24 hr	79.9±5.101	80.733±5.601	0.549	Not Significant

Duration of motor blockade was 955.333±68.969 min in LC group and 735.833±58.133 min in RC group (P < 0.0001). Duration of sensory blockade was 1003.833±65.898 min in LC group and 755.166±62.193 min in RC group (P<0.0001).

Duration of Analgesia was 1048±67.83 min in LC group and 813.166±64.667min in RC group (P<0.0001).

Similar observation which is concurrent with our study was seen in **Cline E et al^[9]** in 2004, who studied Levobupivacaine compared with Ropivacaine in patients with axillary brachial plexus block. sensory block with Ropivacaine was 13.5 ± 2.9 min compared Levobupivacaine 11.1 ± 2.6 min (p=0.003). Motor block was 19.0 ± 2.7 min in Ropivacaine compared to 17.1 ± 2.6 min in Levobupivacaine (p=0.013).

Patil, Kalyani Nilesh et al^[10], in 2015 .The onset of sensory block (4.36 ± 0.81 min) Ropivacaine with Clonidine group was earlier than group using Ropivacaine alone having onset of sensory block (4.84 ± 0.65 min).Onset of motor block was (9.83 ± 1.12 min) in Ropivacaine with Clonidine group and Ropivacaine alone (10.85 ± 0.79 min) ,

Kulkarni SB, Pimpare M et al^[11] in 2016, showed prolonged duration of sensory and motor blockade (p=0.0001) was observed in Levobupivacaine group compared to Ropivacaine .

Gupta S, Gadani HN et al^[51], in 2015, It was found that addition of Clonidine 150 µgm to 30 ml of Ropivacaine 0.75% prolongs the postoperative analgesia significantly as compared to ropivacaine alone.

Mohammad A, Goel S et al^[12], in 2016, mean duration of sensory block in group Ropivacaine with clonidine was 885 ± 57.8 min compared to Ropivacaine group alone which was 676 ± 48.46 min and

mean duration of motor block in group Ropivacaine with clonidine was 770 ± 38.9 min compared to group Ropivacaine alone which was 470 ± 38.9 min.

Malav K, Singariya G, et al^[13], in 2018, , who compared of 0.5% Ropivacaine and 0.5% Levobupivacaine for Sciatic Nerve Block using labat Approach in Foot and Ankle surgery. showed Levobupivacaine duration of sensory block (647.50 min [624.99 – 674.41] vs. 535 min [524.77 – 559.83], respectively; $p < 0.0001$) as well as motor block (1065.0 min [1054.5 – 1068.90] and 945 min [947.13 – 1013.30], respectively; $p < 0.0001$). so was concluded that duration of motor and sensory block was prolonged in Levobupivacaine group as compared to Ropivacaine group. It was found that postoperative analgesia significantly longer in group Levobupivacaine group compared to Ropivacaine group (1320 min [1273.4 – 1321.8] vs. 840 min [759.23 – 812.77] ($p < 0.0001$).

CONCLUSION

In our present study it was observed that drug combination of 0.5% Levobupivacaine 30 ml with Clonidine 75 mcg shows early onset of sensory & motor blockade, prolonged duration of sensory blockade, motor blockade and also prolonged duration of analgesia as compared to drug combination of 0.5% Ropivacaine 30 ml with Clonidine 75 mcg for infraclavicular brachial plexus block. However we did not find any significant changes in hemodynamic parameters of both the study groups. Hence we conclude that the drug combination of levobupivacaine with clonidine is more effective than Ropivacaine with clonidine.

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