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Comparison between Ropivacaine 0.5% And Levobupivacaine 0.5% in Axillary Brachial Plexus Block for Upperlimb Surgeries in a Tertiary Health Care Centre of Tripura- A Observational Study

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ABSTRACT

Introduction

Axillary brachial plexus block is an anesthetic option used for surgeries of arm, forearm and elbow. The use of USG has significantly improved the quality of nerve blocks by direct visualization of nerves and related anatomical structures, needle trajectory and spread of local anesthesia during injection and significantly increases the success rate. Various drugs like Ropivacaine, bupivacine and Levobupivacaine are preferred due to greater margin of safety. However the efficacy of Levobupivacaine in Axillary Brachial Plexus Block has not been studied much. Therefore ,we designed this study to compare the clinical effect of Ropivacaine with Levobupivacaine for ABPB using USG technique.

Methodology

It's a hospital- based Comparative study done in Department of Anesthesiology, AGMC & GBPH from July 2016 to June 2018 (2 years) where 60 patients aged between 18-55 years with ASA grade 1 & 2 who are posted for upper limb surgery were randomly allocated into two groups of 30 each. Patients belonging to ASA grade (3& 4) and age <18years,>55years, Patient with h/o bleeding diathesis, neuromuscular disorder, morbid obesity, prolonged drug therapy & local site infection were excluded from the study.

USG guided axillary nerve block performed under aseptic condition. Sensory and motor blocks were assessed in each nerve territory at 2, 5, 10, 15, 20, 25, and 30 mins, 6 hr, 12 hr , 18hr, and 24 hrs after LA injection after LA injection. Onset of block, duration block and quality of analgesia has been compared. For the duration of the study, the presence of hypotension, bradycardia, hypoxia or nausea and vomiting was recorded and treated according to standard clinical practice.

Result

Among 60 study subjects Mean age was 34.7±12.6 years and majority of the study subjects were males (73.3%) and 26.7% were females. The pre-operative parameters e.g. age, sex, body weight etc. were compared between two groups but there was no statistically significant difference between the two groups ($p>0.05$). The onset of motor blockade among patients of Ropivacaine group was also shorter than patients received Levobupivacaine which was significant. Duration of sensory blockade was shorter in Ropivacaine group & duration of motor blockade was also shorter in Ropivacaine group than Levobupivacaine group and these difference were found to be statistically significant ($p<0.05$). There was no significant change in vital parameters after administration of both the drugs when observed at specific time intervals. VAS Scores were comparable in both the groups.

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Conclusion

The following conclusion can be made from the present study

- Ropivacaine has faster onset of sensory and motor blockade when compared with Levobupivacaine.
- But duration of both sensory and motor blockade was lesser than Levobupivacaine
- Ropivacaine provides stable haemodynamic profile similar to Levobupivacaine.
- It provides satisfactory intra-operative &post-operative analgesia comparable to Levo

KEYWORDS: ABPB(axillary brachial plexus block), USG(utra sonography), Brachial Plexus, Ropivacine, Levobupivacine, sensory block, motor block.

INTRODUCTION

Axillary brachial plexus block is an anesthetic option used for surgeries of arm, forearm and elbow. The conventional trans-arterial technique has potential problems such as nerve injury due to needle trauma and intraneural injection, as well as cardiac and CNS toxicity as a result of vascular uptake or accidental intravascular injection. The use of USG has significantly improved the quality of nerve blocks by direct visualization of nerves and related anatomical structures, needle trajectory and spread of local anesthesia during injection. In addition, USG guidance increases success rate , minimize local anesthetic volume needed for effective nerve block and avoids potential complications.[1,2] Bupivacaine , Ropivacaine and Levobupivacaine are the commercially available intermediate acting local anesthetics. They have some difference in risk of cardiovascular and CNS toxicity but they are more or less similar in analgesic and anesthetic potency. In Axillary Brachial plexus block in which relatively large dose of (~30-40ml) LAs are administered , Ropivacaine and Levobupivacaine are preferred due to greater margin of safety.[3,4] There have been some studies on the efficacy of Bupivacaine and Ropivacaine in Axillary Brachial Plexus Block, and studies comparing Levobupivaine with Bupivacaine or Ropivacaine for neuraxial peripheral nerve blocks.[5,6] However the efficacy of Levobupivacaine in Axillary Brachial Plexus Block has not been studied much.[7,8] Therefore ,we designed this study to compare the clinical effect of Ropivacaine with Levobupivacaine for ABPB using USG technique.

METHODOLOGY

It's a hospital- based Comparative study done in Department of Anesthesiology, AGMC & GBPH from July 2017 to June 2019 (2 years) where 60 patients aged between 18-55 years with ASA grade 1 & 2 who are posted for upper limb surgery were randomly allocated into two groups of 30 each. Patients belonging to ASA grade (3& 4) and age <18years,>55years, Patient with h/o bleeding diathesis, neuromuscular disorder, morbid obesity, prolonged drug therapy & local site infection were excluded from the study.

USG guided axillary nerve block perfomed under aseptic condition.. A short-bevelled 5 cm needle inserted either in-plane or out-of-plane , relative to the probe, towards the four nerves and after careful positioning of needle tip, gentle negative aspiration, and an asymptomatic initial 0.5–1 ml perineural injection, further local anaesthetic is injected in 2 mL aliquots to surround each nerve.

The evaluation of the block of the different nerve territories was performed in an analogous sequence: median, ulnar, radial, brachial cutaneous, musculocutaneous, and intercostobrachial nerve. The characteristics of the sensory block were evaluated by pinprick in the cutaneous areas innervated by all nerves in the upper limb.Sensory block was evaluated by pinprick as follows:

0 (no block): normal sensitivity
1 (onset): reduced sensitivity compared with the same territory in the contralateral upper limb
2 (partial): analgesia or loss of the sharp sensation of the pinprick
3 (complete): anesthesia or loss of sensation to touch

Motor block was evaluated by thumb opposition for the median nerve, thumb adduction for the ulnar nerve, thumb abduction for the radial nerve, and flexion of the elbow for the musculocutaneous nerve.

Motor block was assessed according to the following scale:

0: no block
1 (onset): decreased movement with loss of strength
2 (partial): decreased movement with inability to perform movement against resistance
3 (complete): paralysis

Sensory and motor blocks were assessed in each nerve territory at 2, 5, 10, 15, 20, 25, and 30 mins after LA injection. Patients were considered to be ready for surgery when scores were 2 (partial sensory and motor block).

In the preoperative period, we recorded the following:

- onset of sensory and motor blocks in each nerve (time to reach scores of 1)
- percentage of patients who presented partial or complete sensory and motor block, 30 mins after injection of LA
- time when the patients were ready for surgery (scores of 2 in the nerves involved in the surgical area)

Intraoperatively, quality of anesthesia, fentanyl requirements, and signs of LA toxicity were assessed. In all instances,

surgery was initiated 45 mins after LA injection. The quality of anesthesia was estimated to be (a) deficient, if the block failed and the patient had to receive general anesthesia; (b) partial, if the patient required more than 0.10 mg of IV fentanyl, skin infiltration, or an additional block; (c) sufficient, when the dose of IV fentanyl was 0.10 mg or less; or (d) complete, if no intraoperative analgesia was required. In the postoperative period, pain intensity was assessed with a visual analogue scale (VAS:1-10) at the time of analgesia request and 30 mins after the administration of analgesia. At the time of analgesia request, patients received a dose of 30 mg of IV ketorolac, which was repeated every 8 hrs, for the first 24 hrs postoperatively. Intravenous metamizol (2 g) was administered if the visual analog scale score 30 mins after ketorolac administration was greater than 3. The quality of analgesia was evaluated by the patients 24 hrs after injection of LA: 0 = poor, 1 = adequate, or 2 = excellent.

Sensory and motor blocks were assessed at 6, 12, 18, and 24 hrs after LA injection. For the duration of the study, the presence of hypotension, bradycardia, hypoxia or nausea and vomiting was recorded and treated according to standard clinical practice.

The sample size was determined on the basis of the variable, time ready to surgery, according to the results obtained by other investigators using the same LA in axillary plexus block. The parameters for the sample size calculation were as follows:

- (1) A 3.5-min difference between groups for clinically relevant targets ($);
- (2) the > error level was 0.05;
- (3) the statistical power (A) was 0.80;
- (4) an SD of the measurements (R) of 4.8 mins.

Data are expressed as mean values (SD). For comparison between groups, we used the Student t and W2 tests, with P < 0.05 considered statistically significant. Analysis of the data was done using IBM SPSS version-20. Data was finally presented based on principles of descriptive and inferential statistics. Chi-square test and Independent sample t test was used to test the significance.

RESULTS & DISCUSSION

Among 60 study subjects Mean age was 34.7±12.6 years and majority of the study subjects were males (73.3%) and 26.7% were females. The pre-operative parameters e.g. age, sex, body weight etc. were compared between two groups but there was no statistically significant difference between the two groups (p>0.05). Similar to our study Kulkarni SB et al,[9] Malav K et al,[10] *Vampugalla PS et al*[11] Kaur A et al[12] also found no statistical significant association between mean age, sex & body weight of Ropivacaine group and Levobupivacaine group.

The onset of sensory blockade among patients received Ropivacaine was shorter (10.83±4.1mins) than patients received Levobupivacaine (14.00±3.5mins) & this relation was significant statistically (p<.05). Consistent with our study Kaur et al[8] in their study reported that onset of sensory block was observed from 5 min itself in Ropivacaine group as compared to bupivacaine group (10 min). But in contrast Jain S et al [13] in 2017 and Kulkarni SB et al [5] reported that onset of sensory blockade (p=0.027) was Significantly earlier in group of patients receiving levobupivacaine compared to ropivacaine. Cappelleri et al [14] and Mankad et al [15] has found sensory onset time was almost similar with that of Levobupivacaine and Ropivacaine group which is in contrast to our results.

The onset of motor blockade among patients of Ropivacaine group was also shorter (15.33±4.5 mins) than patients received Levobupivacaine (18.17±3.8mins). This relation was found to be statistically significant (p<0.05). In consistent with our study Mankad et al [15] and Cacciapuoti A et al [14] reported motor onset time was faster in ropivacaine group (9.50±2.403 mins and 14.0 ± 2.3 min respectively) compared with levobupivacaine (12.33±2.54 mins and 17 ± 5 min respectively). Similar finding also found in other studies conducted by O Liisantti Luukkonen J et al, [16] Susana et al[17], Kaur et al[12]. In one of the study by Heavner et al,[18] there was a rapid onset time of sensory blockade which is consistent with our study finding but slower motor blockade with ropivacaine than levobupivacaine, in contrast to our study finding. Indumathi T et al [19] also reported that levobupivacine group had significantly earlier onset of sensory and motor block than group R (p<0.001)

Duration of sensory blockade was shorter (6.50±.938hours) in Ropivacaine group (7.53±1.00hours) & duration of motor blockade was also shorter (7.43±.817hours) in Ropivacaine group than Levobupivacaine group (8.73±.907hours) and these difference were found to be statistically significant (p<0.05). Our study finding was in agreement with study by Susana et al, [17] Kulkarni SB et al, [9] SIA et al, [20] Jain S et al, [13] and Gautier P et al [17] who reported longer duration of sensory loss in Levobupivacaine group than Ropivacaine group. Mankad et al, Cline et al [8] along with few other studies also reported finding in agreement with our finding, duration of motor block was shorter with ropivacaine when compared with levobupivacaine.

There was no significant change in vital parameters after administration of both the drugs when observed at specific time intervals. VAS Scores were comparable in both the groups. Similar to our study finding Mankad et al, [15] Indumathi T et al, [11] and Upadhyay et al [22] also reported that no significant changes was found in hemodynamic parameters between both the groups and in terms of hemodynamic stability, both groups were comparable (P > 0.005) which was not significant.

This study has further denoted that post-operative pain was lesser after administration of Ropivacaine than Levobupivacaine immediately after administration of drugs

(at 10 mins, 15 mins and 20 mins intra operative) but on the long run patients received levobupivacaine experienced less pain than Ropivacaine as evident in further recording of pain at 4, 5, 6, 7, 8, 17 hrs post-operative period. Similar to our result Mageswaran and Choy et al [23] observed no significant difference in VAS score of pain among both the groups.

Table: Comparison of onset of sensory block in Ropivacaine and Levobupivacaine group

Parameter	Ropivacaine n=30	Levobupivacaine n=30	Test applied	t test value	p value
Onset of sensory block (In mins)	10.83±4.1	14.00±3.5	Independent sample t test	-3.1 (-5.1,-1.1)	.003

The onset of sensory blockade among patients received Ropivacaine was shorter than patients received Levobupivacaine.

Table: Comparison of onset of motor block in Ropivacaine and Levobupivacaine group

Parameter	Ropivacaine n=30	Levobupivacaine n=30	Test applied	t test value	p value
Onset of motor block (In mins)	15.33±4.5	18.17±3.8	Independent sample t test	-2.6 (-5.0,-66)	.01

The onset of motor blockade among patients received Ropivacaine was shorter than patients received Levobupivacaine.

Table: Comparison of duration of sensory block in Ropivacaine and Levobupivacaine group

Parameter	Ropivacaine n=30	Levobupivacaine n=30	Test applied	t test value	p value
Duration of sensory block (In hours)	6.50±.938	7.53±1.00	Independent sample t test	-4.1 (-1.5,-.53)	.000

Above result denotes statistical significant shorter duration of sensory blockade in Ropivacaine group than in Levobupivacaine group.

Table: Comparison of duration of motor block in Ropivacaine and Levobupivacaine group

Parameter	Ropivacaine n=30	Levobupivacaine n=30	Test applied	t test value	p value
Duration of motor block (In hours)	7.43±.817	8.73±.907	Independent sample t test	-5.8 (-1.7,-.85)	.000

Above result denotes statistical significant shorter duration of motor blockade in Ropivacaine group than in Levobupivacaine group.

CONCLUSION

The following conclusion can be made from the present study

- Ropivacaine has faster onset of sensory and motor blockade when compared with Levobupivacaine.
- But duration of both sensory and motor blockade was lesser than Levobupivacaine
- Ropivacaine provides stable haemodynamic profile similar to Levobupivacaine.

- It provides satisfactory intra-operative &post-operative analgesia comparable to Levobupivacaine.

BIBLIOGRAPHY

1. 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
2. Williams SR, Chouinard P, Arcand G, Harris P, Ruel M, Boudreault D. Ultrasound guidance speeds execution and improves the quality of supraclavicular block. AnesthAnalg 2003; 97(5): 1518-23.
3. Trachez MM, Zapata-Sudo G, Moreira OR, Chedid NG, Russo VF, Russo EM. Motor nerve blockade potency and toxicity of non-racemic bupivacaine in rats. ActaAnaesthesiolScand2005;49(1):66–71.
4. Zapata-Sudo G, Trachez MM, Sudo RT, Nelson TE. Is comparative cardiotoxicity of S(−) and R(+) bupivacaine related to enantiomer-selective inhibition of L-type Ca(2+) channels? AnesthAnalg 2001;92(2):496–501.
5. Gristwood RW. Cardiac and CNS toxicity of Levobupivacaine: strengths of evidence for advantage over Bupivacaine. Drug Saf2002; 25: 153-63.
6. Leone S, Cianni SD, Casati A, Fanelli G. Pharmacology, toxicology and clinical use of new longacting local anesthetics, Ropivacaine and Levobupivacaine.ActaBiomed2008; 79: 92-105.
7. Cline E, Franz D, Polly RD, Maye J, Burkard J, Pellegrini J. Analgesia and effectiveness of Levobupivacaine compared with Ropivacaine in patient undergoing an axillary brachial plexus block. AANAJ2004;72(5):339 – 45.
8. Mangeswaran R, Choy YC. Comparison of 0.5% Ropivacaine and 0.5 % levobupivacaine for infra clavicular supraclavicular biracial plexus block. Med J Malayasia.2010;65(4): 302 -3.
9. Kulkarni SB, Pimpare M, Govardhane BT. Comparison of levobupivacaine with ropivacaine for supraclavicular brachial plexus block.Int J Res Med Sci. 2016;4(9):3789-96.
10. Malav K , Singariya G , Mohammed S , Kamal M, Sangwan P, Paliwal B. Comparison of 0.5% Ropivacaine and 0.5% Levobupivacaine for Sciatic Nerve Block Using Labat Approach in Foot and Ankle Surgery. Turk J Anaesthesiol Reanim 2018; 46: 15-20.
11. Vampugalla PS, Vundi VR, Perumallapalli KS, Kumar CV, Chandrakala K, P. Mallika M, Raja SP. A comparative study of intrathecal ropivacaine with fentanyl and L-bupivacaine with fentanyl in lower abdominal and lower limb surgeries. International Journal of Basic & Clinical Pharmacology 2015; 4(6):1147-55.
12. Kaur A, Singh RB, Tripathi RK, Choubey S. Comparision between Bupivacaine and Ropivacaine in patients undergoing forearm surgeries under axillary brachial plexus block: A prospective randomized study. Journal of Clinical and Diagnostic Research 2015;9(1):5446.
13. Jain S, Bendwal HP, Deodhar P, Bhambani P, Romday R, Jain P. Comparative study of ropivacaine (0.5%) plain versus levobupivacaine (0.5%) plain in gynecological surgeries. Int J Reprod Contracept Obstet Gynecol 2017 Apr;6(4):1573-7.
14. Cappelleri G, Aldegheri G, Danelli G. Spinal anesthesia with hyperbaricLevobupivacaine and Ropivacaine for outpatient knee arthroscopy:a prospective, randomized, double-blind study. Anesth Analg. 2005;101:77–82.
15. Mankad P P ,Makwana C J , Shah J . A comparative study of 0.5% ropivacaine and 0.5% levobupivacaine in supraclavicular brachial plexus block. Int J Med Sci Public Health.2016;5(1):74-79.
16. Liisanantti O, Luukkonen J, Rosenberg PH. High dose bupivacaine, levobupivacaine and ropivacaine in axillary brachial plexus block. ActaAnasthesiol Scand2000;48(5):601-6.
17. O'Donnell BD, Riordan J, Ahmed I, Iohom G. A clinical evaluation of block characterestics using one millilitre 2% lidocaine in ultrasound guided axillary brachial plexus block. Anesthesia& Analgesia. 2010;111:808–810.
18. Heavner JE. Cardiac toxicity of local anesthetics in the intact isolated heart model: a review. Reg Anesth Pain Med. 2002;27(6):545-55. Obstet Gynecol. 2011;117(3):618-26.
19. Indumathi T, Manjula R, Sangeetha C, Vasundhara M. Comparative Study of Intrathecal Ropivacaine and Levobupivacaine With Fentanyl And Magnesium As Adjuvants For Lower Abdominal Surgeries. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) 2014 May;13(5):39-43.
20. Sia AT, Goy RW, Lim Y, Ocampo CE. A Comparison of Median Effective Doses of Intrathecal Levobupivacaine and Ropivacaine for Labor Analgesia. Anesthesiology 2005 Mar; 102(3): 651-6.
21. Gautier P, Kock MD, Huberty L, Demir T, Izydorczic M. Vanderick B. Comparison of the effects of intrathecal ropivacaine, levobupivacaine, and bupivacaine for Caesarean section. British Journal of Anaesthesia 2003; 91(5): 684-9.

22. Upadhyay R, Godwin RB, Setiya M. Comparative Study of Ropivacaine and Levobupivacaine given Paravertebrally in Breast Cancer Surgeries. International Journal of Scientific Study 2017 Jul; 5(4):212-8.
23. Mageswaran R, Choy YC. Comparison of 0.5% ropivacaine and 0.5% levobupivacaine for infraclavicular brachial plexus block. Med J Malaysia 2010;65(4):300–3.