DOI: 10.21276/aimdr.2019.5.3.AN4

Original Article ISSN (O):2395-2822; ISSN (P):2395-2814

Comparative Study of Levobupivacaine with Butorphanol and Ropivacaine with Butorphanol in Supraclavicular Brachial Plexus Block

Gowthaman T.B.[1], Atul Kumar Singh[2], Gyanendra Kumar Sinha[3]

[1]Junior Resident, Department of Anaesthesiology, Institute of Medical Sciences, Varanasi.
[2]Assistant Professor, Department of Anaesthesiology, Institute of Medical Sciences, Varanasi.
[3]Professor, Department of Anaesthesiology, Institute of Medical Sciences, Varanasi.

Received: March 2019
Accepted: March 2019

ABSTRACT

Background: Ropivacaine and levobupivacaine are less cardiovascular and central nervous system toxic, being an alternative to bupivacaine. Butorphanol, an opioid significantly prolongs the duration of the local anaesthetics. **Methods:** A comparative, Prospective, Randomized, Clinical study was conducted in 60 patients of either sex of ASA I,II ,with age group 18-60 years undergoing upper limb orthopaedic surgeries under USG guided Supraclavicular Brachial Plexus block. Patients were randomly allocated to Group L: 30ml 0.5% Levobupivacaine+600 mcg Butorphanol. Group R: 30ml 0.5% Ropivacaine with 600mcg Butorphanol. Block characteristics were compared as a primary outcome. The data were analyzed with Student-t test. **Results:** Heart rate, Mean BP, Onset and duration of sensory and motor blockade, Post-op VAS score(every 1 hour for 16hours) were compared intraoperative as well as in the postoperative period. Demographic and hemodynamic data were comparable. All hemodynamic parameters compared were insignificant (P>0.5%).The onset of sensory and motor was significantly earlier in GROUP L (P =0.0048, P=0.002) compared to GROUP R. The duration of sensory and motor block was significantly higher in GROUP L (P=0.00073, P=0.00021). Group R required rescue analgesic earlier than Group L. **Conclusion:** Though both are long acting and safer than bupivacaine, Levobupivacaine is better than ropivacaine in terms of early onset of sensory-motor blockade and prolonged duration of sensory-motor blockade. Butorphanol augments the efficacy of local anesthetics without any untoward side effects.

Keywords: Levobupivacaine; bupivacaine; butorphanol; supraclavicular brachial plexus.

INTRODUCTION

Pain is as old as life. It is an unpleasant sensation which only the individual himself can appraise. Regional anaesthesia is an excellent adjunct or alternative to general anaesthesia for extremity surgeries.[1] Post anaesthesia nausea, vomiting and other side effects of general anaesthesia such as atelectasis, hypotension, ileus, deep vein thrombosis are reduced. It provides superior postoperative analgesia and hastens the recovery from anaesthesia. Regional anesthesia is the recommended technique for upper and lower limb surgeries with better postoperative profile.

Considerable research has been conducted over years in order to determine the ideal local anesthetic drug. An ideal drug should have a fast onset of sensory and motor blockade, differential offset, with an earlier offset of motor than sensory blockade, enabling early ambulation with prolonged analgesia. Several combinations of LAs and adjuvants such as tramadol,sufentanyl, clonidine, and fentanyl have been employed in the search for near ideal agent, which remains elusive.[2-4] Currently, levobupivacaine (S(−)-enantiomer of bupivacaine) with favorable clinical profile and lesser cardiotoxicity when compared with racemic bupivacaine is being favored LA for regional block.[5] Butorphanol is an agonist at κ receptors. Its activity at μ receptors is either antagonistic or partially agonistic. It is five to eight times as potent as morphine.[6]

Name & Address of Corresponding Author
Dr. Atul Kumar Singh,
Assistant Professor,
Department of Anaesthesiology,
Institute of Medical Sciences,
BHU, Varanasi 221005.

MATERIALS AND METHODS

After Institutional Ethical Approval and written informed consent, 60 patients aged 18-70 years, of either sex, of American Society of Anaesthesiologist (ASA) grade I or II scheduled for upper limbs orthopedic surgeryunder USG guided Supraclavicular brachial plexus between December 2016 and June 2018 were included in this prospective, randomized, controlled, double-blinded

trial. This is a randomized, controlled, prospective study in 60 patients posted for upper limb surgeries. Patients with history of end-organ dysfunction, pregnancy, hypersensitivity to study drugs, contraindication to supraclavicular brachial plexus block were excluded.

The patients were randomly allocated into two groups using standard randomization code. The Group R of 30 patients receiving 30 ml of 0.5% ropivacaine with butorphanol 600 microgram (0.6 ml) as an adjuvant and the Group L of 30 patients receiving 30 ml of 0.5% levobupivacaine with butorphanol 600 microgram(0.6 ml) as an adjuvant. The procedure was done only with USG guided brachial plexus block in 60 patients. All the patients were assessed for sensory blockade by touching the corresponding dermatomes with blunt end of 26 gauge needle. The motor block was assessed by asking patients to move the thumb where grade 0: normal (patient was able to touch the pulp of little finger with pulp of thumb), grade 1 : partial block (patient was able to touch the pulp of index finger with pulp of thumb), grade 2 : complete block (thumb to lateral aspect of little finger). All patients where desired level of anesthesia was not achieved within 20 min were regarded as block failure and excluded from the study.

The parameters assessed were hemodynamic parameters, time of onset of sensory and motor block and duration of sensory and motor block and postoperative pain assessment by VAS score.After taking a preoperative baseline value, vital parameters, like, systolic blood pressure (SBP), diastolic bloodpressure (DBP), arterial saturation (SpO2), respiratoryrate (RR), and heart rate (HR) were monitored at every 3 min interval till 30 min of LA injection and then every 5 min till 1st h and thereafter every 30 min till the end of surgery. Adverse events such as hypotension (20% decrease in relation to the baseline value), bradycardia (HR <60 bpm), hypoxemia
(SpO2 90%) and perioperative nausea and vomiting were recorded.The data from the present study was systematically analyzed by Statistical Package for Social Sciences version 17.0 (SPSS) software. Unpaired t-test was applied for demographic data, hemodynamic parameters, onset and duration of sensory/motor blockade and duration of analgesia, Chi-square test was applied for age,sex and ASA grades. P value was considered as significantif <0.05 and highly significant if <0.001.

Patient's perception of painPost-operatively, when VAS was equal to or more than 4, diclofenac sodium aqueous solution 75 mg was given as rescue analgesic.

RESULTS

The study groups were comparable in terms of demographic profile, baseline hemodynamic parameters, type of surgical procedure and the duration of the surgery. The primary outcome was to compare the onset of sensory-motor blockade between Group R (0.5% Ropivacaine + butorphanol 600 microgram) and Group L (0.5% Levobupivacaine + butorphanol 600 microgram) patients. The secondary objective was to compare the duration of post-operative analgesia between Group L and Group R patients.

The results of our present study was, there was significantly earlier onset of sensory and motor block with levobupivacaine group (p=0.0048, P=0.002) in comparison with ropivacaine group and the duration of sensory as well as motor block was significantly longer in levobupivacaine group(P=0.0007, P= 0.0002) than the ropivacaine group.

Table 1: Comparison of block characteristics and VAS Score

Parameters	Group L (n=30)	Group R (n=30)	P-value
Onset of Sensory Block (min)	10.417±0.9293	11.433±1.633	0.0048
Onset of motor block(min)	11.069±1.13397	12.233±1.6543	0.002
Duration of sensory block(hour)	12.1333±1.174	11.2167±0.7506	0.00073
Duration of motor block (hour)	11.18±0.7483	10.45±0.6867	0.00021
The average VAS score at 14 hours	47.30 ± 6.556	54 ± 7.118	0.0041

In our present study, the average duration of sensory block was 12.1 ± 1.174 hours in Group L which was longer than it was in Group R (11.27 ± 0.7507 hours). In our study, the mean onset of sensory block and motor block was significantly early in case of Group L (Levobupivacaine with butorphanol – 10.417 ± 0.9293) compared with Group R (Ropivacaine with butorphanol – 11.43 ± 1.6333).

The VAS score average was significantly lower in Group L than Group R. The VAS score was significant only after 10 hours. The rescue analgesic was required in Group R patients little earlier than Group L patients. Observed side effects included nausea, shivering in few patients and did not vary between the two groups.

DISCUSSION

In this study, we demonstrated that the addition of butorphanol to levobupivacaine can significantly: decrease the concentration of levobupivacaine required for surgical anesthesia; shortens the sensory and motor block onset time; reduce the offset time for motor block; prolong the duration of postoperative analgesia; reduce the total LA dose

without any perioperative analgesic compromise; provides significantly lower postoperative VAS pain scores. The supraclavicular approach of Kulenlkampff results in a homogenous blockade of the nerves of the brachial plexus.[7] Ultrasound provides better visualization and hence complications like vascular puncture and pneumothorax are less likely to occur. The ultrasound probe used is a compact linear transducer. It provides more space for the operator for giving the block.[6] There was significantly earlier onset of sensory and motor block with levobupivacaine group (p=0.0048, P=0.002) in comparison with ropivacaine group and the duration of sensory as well as motor block was significantly longer in levobupivacaine group(P=0.0007, P= 0.0002) than the ropivacaine group. The VAS score average was significantly lower in Group L than Group R. The VAS score was significant only after 10 hours. The rescue analgesic was required in Group R patients little earlier than Group L patients.

In our present study, the average duration of sensory block was 12.1 ± 1.174 hours in Group L which was longer than it was in Group R (11.27 ± 0.7507 hours). In a similar study conducted by LT Erike cline et al., it was found that the duration of sensory analgesia was longer in the Levobupivacaine group (831 minutes) than in the Ropivacaine group (642 minutes) with a 'P value' of 0.013. This difference was probably due to the fact that they had used higher volume (40 ml of 0.5% Levobupivacaine and 40 ml of 0.5% Ropivacaine) of local anesthetics and also had added additives to prolong the action (1 : 200000 of epinephrine). The technique used in their study was 'axillary brachial plexus block'.

In our study, the mean onset of sensory block and motor block was significantly early in case of Group L (Levobupivacaine with butorphanol – 10.417 ± 0.9293) compared with Group R (Ropivacaine with butorphanol – 11.43 ± 1.6333). The results obtained were similar to the prospective, randomized control trial done by SKulkari et al., in 2017 in 60 patients, comparing 30 patients in each group, using 0.5% levobupivacaine and 0.5% ropivacaine with 600 microgram butorphanol and concluded that there was significant earlier onset of sensory (P=0.027) and motor blockade (P=0.0001) with levobupivacaine than ropivacaine. The time for first rescue analgesia required post operatively was much longer in Group L (13.2333±1.1651hr) as compared to Group R(10.8667±0.91852 hr) and the difference was significant (p=0.0001).

The real-time ultrasound imaging during supraclavicular brachial plexus blocks can facilitate nerve localization and needle placement and examine the pattern of local anesthetic spread.[8] Acomparative study between conventional and ultrasound guided block demonstrated that USG guided block is safe and effective method and the incidence of complications were less with the USG as it provides real-time visualization of underlying structures.[9] Ropivacaine, a newer amide local anesthetic, is considered to have a better tolerability profile for neuro-cardiovascular tissues but several case reports of ropivacaine-induced seizures have been reported in literature.[10-12]

CONCLUSION

Though both are long acting and safer than bupivacaine, Levobupivacaine is better than ropivacaine in terms of early onset of sensory-motor blockade and prolonged duration of sensory-motor blockade. Butorphanol augments the efficacy of local anesthetics without any untoward side effects.

REFERENCES

1. Winnie AP, Collins VJ . The subclavian perivascular technique of brachial plexus anaesthesia .Anaesthesiology1964 ; 25 : 35–63.
2. Robaux S, Blunt C, Viel E, Cuvillon P, Nouguier P, Dautel G, et al.Tramadol added to 1.5% mepivacaine for axillary brachial plexusblock improves postoperative analgesia dose-dependently. AnesthAnalg 2004;98:1172-7.
3. Antonucci S. Adiuvants in the axillary brachial plexus blockade. Comparison between clonidine, sufentanil and tramadol. Minerva Anestesiol 2001;67:23-7.
4. Geze S, Ulusoy H, Ertürk E, CekicB, Arduc C. Comparison of local anesthetic mixtures with tramadol or fentanyl for axillary plexus block in orthopaedic upper extremity surgery. Eur J Gen Med 2012;9:118-23.
5. Foster RH, Markham A. Levobupivacaine: A review of its pharmacology and use as a local anaesthetic. Drugs 2000;59:551-79.
6. Miller RD. Anesthesia, 8th edn. Philadelphia, PA: Churchill Livingstone Elsevier, 2010;1:904.
7. Lanz E, Theiss D, Jankovic D. The Extent of Blockade Following Various Techniques of Brachial Plexus Block.AnesthAnalg.1983; 62:55-8.
8. Chan VW, Perlas A, Rawson R, Odukoya O. Ultrasound-guided supraclavicular brachial plexus block. AnesthAnalg. 2003; 97:1514–7.
9. Honnannavar KA, Mudakanagoudar MS. Comparison between conventional and ultrasound-guided supraclavicular brachial plexus block in upper limb surgeries. Anesthesia, essays and researches. 2017 Apr;11(2):467.
10. Eledjam JJ, Gros T, Viel E, et al. Ropivacaine overdose and systemic toxicity. Anaesth Intensive Care 2000; 28: 705–7.
11. Korman BF, Riley RH. Convulsions induced by ropivacaine during interscalene brachial plexus block.AnesthAnalg 1997; 85: 1128–9.
12. Muller M, Litz RJ, Huler M, Albrecht DM. Grand mal convulsion and plasma concentrations after intravascular injection of ropivacaine for axillary brachial plexus blockade. Br J Anaesth 2001; 87: 784–7.

How to cite this article: Gowthaman TB, Singh AK, Sinha GK. Comparative Study of Levobupivacaine with Butorphanol and Ropivacaine with Butorphanol in Supraclavicular Brachial Plexus Block. Ann. Int. Med. Den. Res. 2019; 5(3):AN12-AN14.

Source of Support: Nil,**Conflict of Interest:** None declared