JOURNAL OF CRITICAL REVIEWS

ISSN- 2394-5125 VOL 07, ISSUE 19, 2020

Comparison of the Efficacy of 0.5 Percent Levobupivacaine with a Combination of 0.5Percent Levobupivacaine and Hyaluronidase, in Ultrasound Guided Axillary Brachial Plexus Block.

Dr.Yogesh Magan Suryavanshi[1], Dr. Prasad Madhavrao Sule[2], Dr.Shraddha Kamal Mundra[3], Dr.Mukesh Bharat Parmar[4(Corresponding Author)]

1. Associate professor, Departent of Anaesthesia, SMBT Institute of Medical science and research centerDhamangaonNashik.
2. Assistant Professor, Department of Anaesthesiology, Swami RamanandTirth Rural Govt Medical College, Ambajogai.
3. Associate professor, Department of Anaesthesiology, Rural Medical College, Pravara Institute of Medical Science,Loni.
4. Assistant professor, Departent of Anaesthesia, SMBT Institute of Medical science and research centerDhamangaonNashik.

ABSTRACT

Introduction

Axillary block is a regional anesthesia for surgeries atand below the elbow.Complications associated with peripheral blocks using blindapproaches are addressed with advent of ultrasound guidance.Hyaluronidasedrug works as a spreading factor. Combination ofultrasound guidance and hyaluronidase in addition to local anesthetics in peripheralblocks will increase efficacy and reduce complications. The aim and objective of the study is to compare the efficacy of 0.5%Levobupivacaine with a combination of 0.5% Levobupivacaine and hyaluronidase inUSG guided axillary brachial plexus block for forearm and hand surgeries withrespect to: Onset of sensory and motor block, duration of sensory blockand time to rescue analgesia.

Keywords: Axillary brachial plexus block; Hyaluronidase; Levobupivacaine; sensory block; motor block.

INTRODUCTION

Ultrasound imaging allows direct visualization of peripheral nerves,the blockneedle tip, and local anesthetic distribution. This imaging modality is highly useful forguiding targeted drug injections and catheter placement.[(1)]The improved accuracy of2needle placement using ultrasound reduces the risk of complications and their costsassociated with these procedures.[(2)]Local Anesthetics are drugs that prevent conduction of electrical impulses onthe membranes of nerve and muscle.[(3)]They are classified into – Aminoesters andAminoamides. Levobupivacaine is an aminoamide local anesthetic.Adjutants are pharmacological drugs that when co-administered with localanaesthetic agents may improve speed of onset as well as the quality and duration ofanalgesia. Various additives can be added to local anesthetic for enhancing theperipheral nerve block[(4)] like Epinephrine, Clonidine, Dexmedetomidine,Buprenorphine, Dexamethasone, Tramadol, Sodium bicarbonate and

hyaluronidase.Hyaluronidase is widely used in ophthalmologic nerve blocks for better spreadof the drug.It depolymerizes the mucopolysaccharide hyaluronic acid, a component ofthe mucoprotein substance or tissue cement. Hyaluronidase thereby renders the tissuesmore readily permeable to injected fluids (spreading effect) by increasing tissuemembrane permeability and reducing the viscosity.[5]The outcome is significantly improved for most techniques in peripheralregional anaesthesiawhen direct ultrasonographic visualization is used. With the helpof ultrasonography, the anaesthetist can directly visualize relevant nerve structures forall nerve blocks at all levels. Such direct visualization improves the quality of nerveblocks and avoids complications.[6]

OBJECTIVES

To compare the efficacy of 0.5% Levobupivacaine with a combination of0.5% Levobupivacaine and hyaluronidase in USG guided axillary brachial plexusblock for forearm and hand surgeries with respect to onset of sensory block, onset of motor block, duration of sensory block and time to rescue analgesia.

MATERIALS AND METHODS

Anobservational prospective study was carried out among 60 adult patients in the age group of 18-60 years belonging to ASA PS 1 and 2scheduled to undergo elective upper limb orthopedic procedures in the orthopedic theatre. The study was conducted fromfrom January 2016 to October 2017. All thepatients were assessed and those with normal clinical,hematological, biochemical andradiological parameters were selected. Informed written consent was obtained from all the patients and they were alternately assigned to two groups Group A andGroup B each containing 30 patients.

GROUP A – Patients undergoing Ultrasound guided Axillary Brachial plexus blockwith 20 ml of 0.5% Levobupivacaine and Hyaluronidase 300 Units (15U/ml of localanesthetic)

GROUP B – Patients undergoing Ultrasound guided Axillary Brachial plexus blockwith 20 ml of 0.5% Levobupivacaine.

American Society of Anesthesiology Physical status Class 1 (A normal healthy patient) and Class 2 (A patient with mild systemic illnessand weight 40 to 80kg alone were included in the study. Any patient with history of bleeding disorders, documented neuromuscular disorders, known allergy to Local anesthetics drugs, Psychiatric patients and if on anticoagulants were excluded from the study. Considering the mean sensory block onset time as around 13.8 minutes in the treatment group[7] and expecting a difference of 5 to 6 minutes from the controlgroup, using a standard error of 6 the required sample size was calculated to be 30 in each group.

The following parameters were observed following the block.

Hemodynamic parameters likepulse rate, non invasive blood pressure, oxygensaturation were monitored. Mean arterial blood pressure (MAP) and pulse rate (PR),oxygen saturation were recorded before application of the block as well asimmediatelyafter block & 3 min intervals until the end of the operation. Any drop in blood pressure more than 20% from the baseline signifies hypotension andwas managed with Inj ephedrine 6 mg. Any decrease in pulse rate of less than 60 beats/min was managed with Inj.atropine 0.6mg. Sensory blockwas tested with a 22-gauge hypodermic needle by using thepinprick test and compared with the same stimulation in the contralateralhand.Sensory block was evaluated by the pinprick method in the nerve distributionof the radial nerve

(dorsum of thumb), ulnar nerve (palmar aspect of fifth finger),median nerve (palm of the hand) and musculocutaneous nerve (lateral aspect offorearm). A three-point scoring system was used: 2=normal sensation; 1=impairedsensation; 0=loss of sensation.Onset of Sensory Block[8]was defined as the time between the end of last injectionand thetotal pinprick response score of 0over hand and forearm.Motor blockwas assessed in the nerve distribution of the radial nerve (wristextension), ulnar nerve (adduction of fourth and fifth finger), median nerve(flexion of the distal phalangeal joint on the second finger) and musculocutaneousnerve (flexion of the elbow), with the following scoring: 2=normal motorfunction; 1=impaired motor function; 0=no motor function.Onset of motor blockade[8]was defined as the time taken from the injection of drugto development of total block score of 0.37. Duration of sensorial block (minute) was recorded asTime interval between withdrawal of theneedle and reappearance of paresthesia in the 4 nerve distribution areas.First analgesic requirement time (minute) ie,Rescue analgesia is defined as thetime interval between block placement and patient's first analgesic request.Postoperatively pain scores were recorded by using visual analogue score[9]between 0 to 10(0-no pain,10= most severe pain).Rescue analgesia was given atVAS score of 4 or above.

OBSERVATION AND RESULTS

The following observations were made and data were collected using a structured questionnaire Sex, Age, Weight,Height, ASA physical status, Pulse rate, blood pressure, Oxygen saturation at 5 minintervals until 30 min, then at 1 hour, thereafter every hour till 12 hours were documented along with onset time of sensory block, onset time of motor block, duration of sensory blockade, duration of analgesia and any untoward side effects. Data were analyzed using SPSS16.0V software. Means were calculated for descriptive analysis.Two sided independent studentst test was used to analyze continuous data and chi square test for categorical data. P value <0.05 was considered asstatistically significant.

DEMOGRAPHICDATA

The mean age of the participants in group A was 44.9 ± 13.6 and in group B was 43.4 ± 16.2. The mean height in group A and B were 164.8±8.7cms and 164.5 ± 8.5cms respectively. The mean weight in group A was 66.8±6.0 Kgand ingroup B was 64.8 ± 6.7 Kg. 83.3% of participants in both the groups were in ASA PS grade 1. The two groups were comparable with respect to their ageand sex. There was no statistically significant difference among two groups in demographic profile.

Table 1 :- Comparison of sex between Group A and GroupB

Sex	Group A (Levobupivacaine and hyaluronidase)		Group B (Levobupivacaine)	
	Count	Percent	Count	Percent
Male	15	50.0	17	56.7

ISSN- 2394-5125 VOL 07, ISSUE 19, 2020

Female	15	50.0	13	43.3

Table 2 :- Comparison of age between Group A and Group B

Age	Group A (Levobupivacaine and hyaluronidase)	Group B (Levobupivacaine)
	Count	Count
18-20	2	7
20 – 29	5	2
30 – 39	5	1
40 – 49	3	9
50 – 59	7	5
>=60	7	6
Mean ± SD	44.9 ± 13.6	43.4 ± 16.2

Table 3 :- Comparison of height between Group A and Group B

Group	Mean Height (cm)	SD	N	t value	P
Group A (Levobupivacaine and hyaluronidase)	161.8	8.5	30	1.03	0.302
Group B (Levobupivacaine)	159.5	8.4	30		

Table 4 :- Comparison of weight between Group A and Group B

Group	Mean weight(Kg)	SD	N	t value	P
Group A (Levobupivacaine and hyaluronidase)	62.72	6.32	30	1.19	0.21
Group B (Levobupivacaine)	66.65	6.72	30		

ISSN- 2394-5125 VOL 07, ISSUE 19, 2020

Table 5 :- Comparison of ASA PS between Group A and GroupB

ASA PS	Levobupivacaine and hyaluronidase	Levobupivacaine	χ^2	P
	Count	Count		
Grade I	25	25	0	1.000
Grade II	5	5		

Table 6 :- Comparison of Oxygen saturation between Group A and Group B.

Intraoperative	No of cases	Mean ±S.D(%)	P value
Group A	30	99±0.0041	0.9602
Group B	30	99±0.0029	
Postoperative	No of cases	Mean±S.D	
Group A	30	100±0.00	
Group B	30	99±0.002	

Table 7 : -Comparison of pulse between Group A and Group B

	Mean(min)	S.D	P value
Group A	81.82	1.69	0.343
Group B	81.92	1.599	

Table 8 :- Comparison of Mean arterial pressure between Group A and Group B

	Mean(mm/Hg)	S.D	P value
Group A	104.2	2.71	0.891
Group B	103.01	1.92	

ISSN- 2394-5125 VOL 07, ISSUE 19, 2020

Discussion

The popularity of peripheral nerve blocks grew because it decreases pain postoperatively, reduces incidence of nausea, decreases need for post operative analgesics, shortens post anesthesia care time, and most importantly increases patient satisfaction.[10,11,12] Multimodal perioperative care pathways designed for enhanced recovery achieve early recovery after surgical procedures by maintaining preoperative organ function and reducing the stress response following surgery. One key component of such enhanced recovery protocols is standardized analgesic and anesthetic regimens. Peripheral nerve blocks in particular help in enhanced recovery of the patient by the possibility of early mobilization of the patient.[12,13,14] Early in the history of anesthesia, peripheral nerve block techniques were developed. The American surgeons Halsted and Hall described the injection of cocaine into peripheral sites for minor surgical procedures in 1884.[15] Axillary block was first described by Hirschel in 1911[16], but it gained popularity only after Burnham's publication in 1959[17]. With years of modification and development, the technique and concept of axillary block has improved. Brachial plexus (C5-T1) blockade will allow for surgical anesthesia of the upper extremity and shoulder. The Brachial plexus can be blocked at various levels from the roots to the terminal branches – Interscalene block, Supraclavicular block, Infraclavicular block, Axillary block and peripheral blocks at the Midhumeral level, elbow and wrist.[18] Axillary brachial plexus block is popular because of its ease, reliability, and safety.[19] Nerves blocked are the terminal nerves. Indications for axillary block include surgery at and below elbow; forearm and hand.[20]

CONCLUSION

In ultrasound guided axillary brachial plexus block using 0.5% levobupivacaine, addition of 15 units of hyaluronidaseper milliliter of levobupivacaine (300 units in 20 ml) reduces onset of sensory and motor block time therefore shortens the total anaesthetic time before the operation. It also reduces the duration of post operative sensory block time and time to requirement of rescue analgesia.

REFERENCES

1. Andrew T. Gray: Ultrasound-guided Regional Anesthesia: Current State of the Art Anesthesiology 2 2006, Vol.104,368-373.
2. Mercaldi CJ, Lanes SF. Ultrasound guidance decreases complications and improves the cost of care among patients undergoing thoracentesis and paracentesis. Chest. 2013 Feb1;143(2):532-538.
3. Charles B. Berde. Miller's textbook of anesthesia: Chapter 36p.1029
4. Bailard NS[1], Ortiz J, Flores RA.Additives to local anesthetics for peripheral nerve blocks: Evidence, limitations, and recommendations. 2014 Mar 1;71(5):373-85. doi:10.2146/ajhp130336.
5. Bettina Alexandra Buhren, HolgerSchrumpf. Hyaluronidase: from clinical applications to molecular and cellular mechanismsEuropean Journal of Medical Research2016**21**:5
6. A Capek et al. Ultrasound-guided peripheral nerve blocks of the upper limb *Continuing Education in Anaesthesia Critical Care & Pain*, Volume 15, Issue 3, 1 June 2015, Pages160–165.

7. CarliF[1],KehletH,BaldiniG,SteelA,McRae K,SlingerP, Hemmerling T, Salinas F, Neal JM. RegAnesth Pain Med. 2011 Jan-Feb;36(1):63-72.
8. Harold Ellis.Textbook of Ellis anatomy for anesthetist. Part 4 page153
9. Chan VWCan J et al. Ultrasound guidance improves success rate of axillary brachial plexus block.Anaesth.2007Mar;54(3):176-82.
10. Paul JE, et al : Anesthesiology 113:1144,2010
11. Carli F[1], Clemente A. Regional anesthesia and enhanced recovery after surgery. Minerva Anestesiol. 2014Nov;80(11):1228-33.
12. AbdelazeemEldawlatlySaudi J Anesthesiology 2016 apr-jun;10(2):119-120
13. Hall RJ: N Y medJ40:643,1884
14. G. Hirschel, "Anesthesiaof the brachial pleaxus for operations on the upper," München Med Wochenschr, vol. 58, pp. 1555–1556,1911.
15. P. J. Burnham, "Simple regional nerve block for surgery of the hand and forearm," Journal of the American Medical Association, vol. 169, no. 9, pp. 941– 943,1959.
16. Treses T. Horlocker et al. Peripheral nerve blocks. Miller's textbook of anesthesia: Chapter 57p.1730
17. De Jong RH. Axillary block of the brachial plexus.Anesthesiology 22:215,1961
18. Schroeder LE, et al The Efficacy of Axillary Block: AnesthAnalg October 1996 - Volume 83 - Issue 4 - p747-751
19. Koh WU, Min HG, Park HS, Karm MH, Lee KK, Yang HS, et al. Use of hyaluronidase as an adjuvant to ropivacaineto reduce axillary brachial plexus block onset time: a prospective, randomised controlled study. Anaesthesia. 2015Mar;70(3):282-9.
20. Sarvela J etal.Hyaluronidase improves regional ophthalmic anaesthesia with etidocaine. Can J Anaesth. 1992Nov;39(9):920-4.