

Effects of Dexamethasone as a Local Anaesthetic Adjuvant for Ultrasound Guided Brachial Plexus Block: A Prospective, Randomised, Double Blind Study

Naveen Kumar C.P.*, Dheeraj R. Patel*

Abstract

Background: Dexamethasone as an adjuvant in brachial plexus block has been reported to prolong the duration of action of local anesthetic. We performed a prospective, randomised, double blind study to evaluate the effect of dexamethasone 4 mg added to local anaesthetic on the onset and duration of ultrasound guided supraclavicular brachial plexus block. **Materials and Methods:** 60 adult patients undergoing ultrasound-guided supraclavicular brachial plexus block were randomly divided into 2 groups of 30 each. In group 1 patients received 15 ml of 2% lignocaine with adrenaline +15 ml of 0.5% bupivacaine +1 ml of normal saline (NS), in group 2 patients received 15 ml of 2% lignocaine with adrenaline +15 ml of 0.5% bupivacaine + 1 ml of dexamethasone (4 mg). The onset and duration of sensory and motor blockade in the either groups were compared. Using software package SPSS16 statistical analysis was done. Numerical variables compared by Independent samples t-test. Categorical variables compared between groups by Chi-square test. All analysis has been two tailed and $p < 0.05$ has been taken to be statistically significant. **Results:** The groups were comparable in

demographic data. The onset of sensory and motor blockade in group 2 [228.33±32.386 sec; 313.33±33.767 sec] was significantly more rapid compared to group 1 [328.50±40.538 sec; 405.50±41.259 sec] [$p < 0.001$ (HS)]. The duration of motor blockade was significantly longer in group 2 [479.83±37.312 min] compared to group 1 [325.33±36.434 min] [$p < 0.001$ (HS)]. In addition the duration of analgesia in group 2 [601.67±58.492 min] was significantly more compared to group 1 [390.50±38.019 min] [$p < 0.001$ (HS)]. **Conclusion:** We conclude that addition of 4 mg dexamethasone as adjuvant to local anesthetics hastens the onset of sensory and motor blockade with prolongation of the duration of analgesia and motor blockade.

Keywords: Supraclavicular Brachial Plexus Block; Dexamethasone; Lignocaine with Adrenaline; Bupivacaine.

Introduction

Brachial plexus block is a commonly performed regional nerve block of upper extremity and supraclavicular approach is the easiest and most consistent method for surgery below the shoulder joint.

Local anesthetics alone for Supraclavicular brachial plexus block provide good operative conditions but have shorter duration of postoperative analgesia. So various adjuvant like opioids, clonidine, neostigmine, midazolam, etc. were added to local anesthetics in brachial plexus block to achieve quick, dense and prolonged block, but the results are either inconclusive or associated with side effects [1].

Steroids have powerful anti-inflammatory as well as analgesic property. Perineural injection of steroids is reported to influence post operative analgesia [1]. They relieve pain by reducing inflammation and blocking transmission of nociceptive C-fibres and by suppressing ectopic neural discharge [2].

Recently, dexamethasone has been studied as an adjuvant in brachial plexus block and reported to have prolonged the

Author's Affiliation:

*Associate Professor, Department of Anesthesiology and Critical Care, S.S. Institute of Medical Sciences and Research Centre, Davangere, Karnataka.

Corresponding Author:

Naveen Kumar C.P., Associate Professor, Department of Anesthesiology and Critical Care, S.S. Institute of Medical Sciences and Research Centre, Davangere - 577005 Karnataka.

E-mail:

drnaveenkumarcp@gmail.com

Received on 03.02.2017

Accepted on 07.02.2017

duration of action of local anaesthetics with no side effects [3,4].

In this context the present study was undertaken to evaluate the effect of dexamethasone 4mg added to local anaesthetic on the onset and duration of ultrasound guided supraclavicular brachial plexus block.

Materials and Methods

After hospital ethical committee approval and written informed consent from patient. A prospective, randomised, double blind study was undertaken on 60 patients belonging to American Society of Anaesthesiology (ASA) grade 1 and 2 in age group 18-70 years undergoing elective upper limb surgery below shoulder joint. Patients with coagulation disorders, severe respiratory disease, neurodeficits involving brachial plexus, allergy to local anaesthetic, diabetes mellitus, hepatic or renal failure and pregnant women were excluded from study.

Patients were randomly allocated into two groups of 30 patients each. Patients in group 1 received 15ml of 2% lignocaine with adrenaline +15ml of 0.5% bupivacaine +1ml of normal saline (NS). Patients in group 2 received 15 ml of 2% lignocaine with adrenaline +15ml of 0.5% bupivacaine + 1ml of dexamethasone (4mg).

On arrival to the operation theatre, intravenous (i.v) access was secured and monitors were connected (pulse oximetry, Electrocardiography and noninvasive blood pressure monitoring). Drugs were prepared and procedure was performed by anesthesiologist who did not take part in the study.

After proper patient positioning and aseptic precaution supraclavicular brachial plexus block was performed under ultrasound guidance using GE health care machine with high frequency linear probe. After visualisation of subclavian artery pulsation and cluster of hypoechoic nodules of brachial plexus, an In plane approach was used. Using 23 gauge 1.5 inch hypodermic needle local anesthetic was injected and spread of drug at the time of injection was observed in real time.

Sensory and motor blockade of radial, median, musculocutaneous and ulnar nerves were recorded at regular intervals (0,2,4,6,8,10,12,15 & 20 minutes) after drug injection. Sensory blockade of each nerve was assessed by pin prick and compared with the same stimulation on the contralateral hand. Onset of sensory blockade was defined as dull sensation along any of the nerve distribution.

Motor blockade was evaluated by thumb abduction (radial nerve), thumb adduction (ulnar nerve), flexion of elbow (musculocutaneous nerve) and thumb apposition (median nerve). Onset of motor blockade was considered when patient felt heaviness on abduction of arm at shoulder.

Post operatively, duration of analgesia was assessed according to 0-10 Visual Analogue Scale (VAS) for pain at every half an hour interval for first 10 hours and then hourly till patient requested for analgesia/VAS \geq 5. Rescue analgesic in the form of inj.diclofenac sodium 75 mg intramuscularly was used.

The duration of motor blockade was assessed every hourly by asking the patient to move their fingers and ability to raise the hand.

Statistical analysis was done. Numerical variables compared by Independent samples t-test. Categorical variables compared between groups by Chi-square test. The results were considered significant if p value $<$ 0.05 and highly significant if p value $<$ 0.001.

Results

The demographic data in both groups were comparable with respect to patients age, weight, gender ratio and duration of surgery [Table 1].

The onset of sensory and motor blockade in group 2 [228.33 \pm 32.386 sec, 313.33 \pm 33.767 sec] was significantly more rapid compared to group 1 [328.50 \pm 40.538 sec, 405.50 \pm 41.259 sec] [p<0.001 (HS)].

The duration of motor blockade was significantly longer in group 2 [479.83 \pm 37.312 min] compared to group 1 [325.33 \pm 36.434 min] [p<0.001(HS)].

Table 1: Demographic data between two groups

Variable	Group 1 Mean \pm Std dev	Group 2 Mean \pm Std dev	Significance
Age	38.47 \pm 11.48	36.23 \pm 10.773	0.728 (NS)
Weight	67.20 \pm 6.80	67.43 \pm 7.281	0.586 (NS)
Sex (M/F)	19/11	21/9	NS

Table 2: Comparison of parameters between two groups

Variable	Group 1. Mean \pm Std dev	Group 2. Mean \pm Std dev	Significance
Onset of sensory blockade(secs)	328.50 \pm 40.538	228.33 \pm 32.386	0.000 (HS)
Onset of motor blockade(secs)	405.50 \pm 41.259	313.33 \pm 33.767	0.000 (HS)
Duration of motor blockade (mins)	325.33 \pm 36.434	479.83 \pm 37.312	0.000 (HS)
Duration of analgesia (mins)	390.50 \pm 38.019	601.67 \pm 58.492	0.000 (HS)

In addition the duration of analgesia in group 2 There were no complication observed in any of the groups. Intraoperative and post operative vital parameters of all the patients such as Heart rate, Blood pressure and Oxygen saturation were stable.

Discussion

Supraclavicular brachial plexus block is a popular and widely employed regional nerve block technique for perioperative anesthesia and analgesia for surgery of the upper extremity. Local anesthetics alone for supraclavicular brachial plexus block provide good operative conditions but have shorter duration of postoperative analgesia. So various drugs like opioids, clonidine, neostigmine, Midazolam, etc. were used as adjuvant with local anesthetics in brachial plexus block to achieve quick, dense and prolonged block, but the results are either inconclusive or associated with side effects.

The use of corticosteroids as an adjuvant to local anaesthetics for peripheral nerve blocks has rarely been described, the mechanism of action is not clearly understood. The exact dose of dexamethasone to be used in peripheral nerve blocks has not been described.

In our study, use of dexamethasone 4mg along with local anaesthetics significantly improved the onset of sensory and motor blockade as compared to local anaesthetics alone. The early onset of action might be due to the synergistic action with local anaesthetic on blockade of nerve fibres. Similar result were seen in studies done by Prashant A Biradar et. al [4]. Golwala M.P and Colleagues [1].

The duration of motor blockade and analgesia were prolonged with dexamethasone 4mg in comparison with local anaesthetics alone. The studies done by Pathak R.G et.al [5], Ali Movafegh et. al. [3], also found that dexamethasone prolong the duration of motor blockade and analgesia. The mechanism of dexamethasone induced prolongation of peripheral nerve blockade is attributed to glucocorticoid receptor mediated blockade of ion channels and trapping of highly ionised bupivacaine molecules into the

neuronal cells by producing local acidosis of the nerve cell [6,7]. Dexamethasone has shown to inhibit Nitric Oxide synthase, a mediator of local anaesthetics tachyphylaxis [8]. corticosteroids also reduce conduction of nociceptive C-fibres in animal model [9].

There are certain limitations in this study. First, this study didn't exclude the systemic action of steroid following absorption from the injection site. Second, follow-up for nerve injury was not done beyond 24 h. third, prolongation of motor block was an unwanted effect that prevents the early recognition of iatrogenic nerve injury and early ambulation.

Most of studies compared 8 mg of dexamethasone in their study, we used 4 mg of dexamethasone in our study since Tandoc M.N et al [11] in their study found there was no difference in the duration of analgesia and motor block between low dose (4 mg) and high dose (8 mg) dexamethasone groups.

Conclusion

Addition of dexamethasone 4 mg to local anesthetic drugs in ultrasound guided brachial plexus block significantly prolongs the duration of analgesia and motor block in patients undergoing upper limb surgeries and is a safe and cost effective method of providing post operative analgesia.

References

1. Golwala MP, Swadia VN, Dhimar AA, Sridhar NV. Pain relief by dexamethasone as an adjunct to local anaesthetics in supraclavicular brachial plexus block. *J Anaesthesiol clin pharmacol*, 2009; 25:285-8.
2. Honorio T. Benzon, Epidural steroids. In P Prithvi Raj. Pain medicine, a comprehensive review. Mosby publication, 1999.p.259-263.
3. Movafegh A, Razazian M, Hajimaohamadi F, Meysamic A. Dexamethasone added to lidocaine prolongs axillary brachial plexus blockade. *Anesth Analg*, 2006; 102:263-7.
4. Prashant A Biradar, Padmanabha Kaimar,

- Kannappady Gopalakrishna. Effect of Dexamethasone added to lidocaine in supraclavicular brachial plexus block: A Prospective, randomised, double blind study. *Indian Journal of Anaesthesia* 2013; 57(2):180-4.
5. R G Pathak, Anand P Satkar, Rajendra N khade. Supraclavicular brachial plexus block with and without Dexamethasone - A Comparative Study. *International Journal of Scientific and research publications*, 2012 Dec; 2(12).
 6. Curley J, Castillo J, Hotz J, Uezono M, Hernandez S, Lim J, et al. Prolonged regional nerve blockade: Injectable biodegradable bupivacaine/polyester microspheres. *Anesthesiology*, 1996; 84:1401-10.
 7. Kopacz DJ, Lacouture PG, Wu D, Nandy P, Swanton R, Landau C. The dose response and effects of Dexamethasone on bupivacaine microcapsules for intercostal blockade (T9 to T11) in healthy volunteers. *Anesth Analg*, 2003; 96:576-82.
 8. Salvemini D, Settle SL, Masferrer JL, Seibert K, Currie MG, Needleman P. Regulation of prostaglandin production by nitric oxide: An in vivo analysis. *Br J Pharmacol*, 1995; 114:1171-8.
 9. Johansson A, Hao J, Sjolund B. Local corticosteroid application blocks transmission in normal nociceptive C-fibres. *Acta Anaesthesiol Scand*, 1990; 34:335-8.
 10. Iyer CP, Ross L, Joshi G, Robertson B. Efficacy of ropivacaine with or without dexamethasone for enhancing extremity nerve blocks. *Reg Anesth Pain Med*, 2005; 101:886-90.
 11. Tandoc MN, Fan L, Kolesnikov S, Kruglov A, et al., Adjuvant dexamethasone with bupivacaine prolongs the duration of interscalene block: a prospective randomized trial. *J Anesth*, 2011; 25(5):704-9.

Red Flower Publication Pvt. Ltd.

Presents its Book Publications for sale

- | | |
|--|---------------------|
| 1. Breast Cancer: Biology, Prevention and Treatment | Rs.395/\$100 |
| 2. Child Intelligence | Rs.150/\$50 |
| 3. Pediatric Companion | Rs.250/\$50 |

Order from

Red Flower Publication Pvt. Ltd.

48/41-42, DSIDC, Pocket-II

Mayur Vihar Phase-I

Delhi - 110 091(India)

Phone: Phone: 91-11-45796900, 22754205, 22756995, Fax: 91-11-22754205

E-mail: sales@rfppl.co.in