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Research Paper

Comparison of Two Doses of Dexamethasone Added as Adjuvant For Ultrasound Guided Supraclavicular Brachial Plexus Block: a Prospective, Randomised, Double Blind Study

Medical Science

KEYWORDS : Supraclavicular brachial plexus block, two doses of dexamethasone, lignocaine with adrenaline, bupivacaine

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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 two doses of dexamethasone added to local anaesthetic on the onset and duration of supraclavicular brachial plexus block, as there is a need to evaluate the optimal dose of dexamethasone to be used in plexus block.

METHODS: 90 adult patients undergoing ultrasound-guided supraclavicular brachial plexus block were randomly divided into 3groups of 30 each. In group1 patients received 15ml of 2% lignocaine with adrenaline +15ml of 0.5% bupivacaine +2ml of normal saline (NS), in group2 patients received 15 ml of 2% lignocaine with adrenaline +15ml of 0.5% bupivacaine + 1ml of dexamethasone (4mg)+ 1ml of NS, in group3 patients received 15ml of 2% lignocaine with adrenaline +15ml of 0.5% bupivacaine + 2ml of Dexamethasone (8mg). The onset and duration of sensory and motor blockade in all the groups were compared. Statistical analysis was done using one way ANOVA test and post hoc test.

RESULTS: The groups were comparable in demographic data. The onset of sensory and motor blockade in group 3 [169.83±30.157 sec ; 237.67±31.287 sec] were significantly more rapid compared to group 2 [228.33±32.386 sec ; 313.33±33.767 sec] and group 1 [328.50±40.538 sec ; 405.50±41.259 sec] [p<0.001 (HS)]. The duration of motor blockade in group 3 [653.33±57.630 min] was significantly longer compared to group 2 [479.83±37.312 min] and group 1 [325.33±36.434 min] [p<0.001(HS)]. In addition the duration of analgesia in group 3 [766.50±46.278 min] was significantly more compared to group2 [601.67±58.492 min] and group1 [390.50±38.019 min] [p<0.001(HS)].

CONCLUSION: Higher dose(8mg) of dexamethasone is more efficacious than lower dose(4mg) of dexamethasone as an adjuvant with local anaesthetic in supraclavicular brachial plexus block.

INTRODUCTION:

Brachial plexus block is a commonly performed regional nerve block of upper extremity. Local anaesthetics alone provide analgesia for not more than 4 to 8 hours. Different additives like opioids, clonidine, dexmeditomidine have been used to prolong regional blockade,but are associated with side effects like sedation,respiratory depression, psychomimetic effects.

Steroids have powerful anti-inflammatory as well as analgesic property. Perineural injection of steroids is reported to influence post operative analgesia.1They 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 duration of action of local anaesthetics with no side effects. 3,4 There is a need to evaluate the optimal dose of dexamethasone to be used in brachial plexus block.This study examine the effect of two-doses of dexamethasone added to local anaesthetic, on the onset and duration of supraclavicular brachial block.

METHODS:

After hospital ethical committee approval and written informed consent, 90 patients with American Society of Anaesthesiology (ASA) grade 1and 2 in age group 18-70 years undergoing elective upper limb surgery below shoulder joint, were included in the study. Patients with coagulation disorders, severe respiratory disease, neuro-deficit involving brachial plexus, allergy to local anaesthetic, patients with history of peptic ulcer disease, diabetes mellitus, hepatic or renal failure and pregnant women were excluded from study.

Patients were randomly allocated into three groups with each group consisting of 30 patients. In group1 15ml of 2% lignocaine with adrenaline +15ml of 0.5% bupivacaine +2ml of normal saline (NS) was used. In group2 15 ml of 2% lignocaine with adrenaline +15ml of 0.5% bupivacaine + 1ml of dexamethasone (4mg)+ 1ml of NS was used. In group3 15ml of 2% lignocaine with adrenaline +15ml of 0.5% bupivacaine + 2ml of Dexamethasone (8mg) was used.

On arrival to the operation theatre, intravenous (i.v) access was secured and monitors were connected (pulse oximetry, Electro- cardiography and noninvasive blood pressure monitoring). After appropriate patient positioning and aseptic precaution supraclavicular brachial plexus block was performed under ultrasound guidance using GE health care machine with high frequency linear probe, visualising the subclavian artery pulsation and cluster of hypoechoic nodules of brachial plexus. An In plane approach was used, with 23 guage 1.5 inch hypodermic needle. Local anaesthetic spread 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 for first 10 hours and then hourly till patient requested for analgesia/VAS ≥ 5. Rescue analgesic in the form of inj. diclofenac

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sodium 1.5 mg kg-1 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.

The above assessments were carried out by the investigator who was blinded to the drugs administered in the plexus block. Statistical analysis was performed with one way ANOVA test and post hoc test. The results were considered significant if p value < 0.05 and highly significant if p value < 0.001.

RESULTS:
The demographic data in all 3 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 3 [169.83± 30.157 sec; 237.67±31.287 sec] were significantly more rapid compared to group 2 [228.33±32.386 sec ; 313.33±33.767 sec] and group 1 [328.50±40.538 sec ; 405.50±41.259 sec] [p<0.001 (HS)] [Table-2]

TABLE-1

Variables	Group 1 Mean ± SD	Group 2 Mean ± SD	Group 3 Mean ± SD	Significance
Age	38.47 ± 11.48	36.23 ± 10.773	37.80 ± 11.08	0.728 (NS)
Weight	67.20 ± 6.80	67.43 ± 7.281	65.70 ± 6.974	0.586 (NS)
Sex (M/F)	19/11	21/9	20/10	

The duration of motor blockade in group 3 [653.33±57.630 min] was significantly longer compared to group 2 [479.83±37.312 min] and group 1 [325.33±36.434 min] [p<0.001(HS)]. In addition the duration of analgesia in group 3 [766.50±46.278 min] was significantly more compared to group2 [601.67±58.492 min] and group1 [390.50±38.019 min] [p<0.001(HS)].

There were no side effects or 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.

TABLE-2

Variables	Group 1. Mean ± SD	Group 2 Mean ± SD	Group 3 Mean ± SD	Significance	Between groups difference
Onset of sensory blockade(sec.)	328.50 ± 40.538	228.33± 32.386	169.83± 30.157	0.000 (HS)	I & II, I & III, II & III
Onset of motor blockade(sec.)	405.50± 41.259	313.33± 33.767	237.67± 31.287	0.000 (HS)	I & II, I & III, II & III
Duration of motor blockade (min.)	325.33± 36.434	479.83± 37.312	653.33± 57.630	0.000 (HS)	I & II, I & III, II & III
Duration of analgesia (min.)	390.50± 38.019	601.67± 58.492	766.50± 46.278	0.000 (HS)	I & II, I & III, II & III

DISCUSSION:
Brachial plexus block under ultrasound guidance is an easy and a relatively safe procedure for upper limb surgeries. A combination of lignocaine and bupivacaine provided good operating condition but the duration of analgesia is rarely maintained for more than 4-6 hrs.

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 8mg along with local anaesthetics significantly improved the onset of sensory and motor blockade as compared to dexamethasone 4mg added to local anaesthetics or 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 superior with dexamethasone 8mg group in comparison with dexamethasone 4mg group or 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 Previous studies3,10 have shown that the dexamethasone prolonged analgesia and motor block where adrenaline was not a part of anaesthetic mixture.

The addition of dexamethasone in a higher dose(8mg) in our study significantly prolonged the duration of motor block and analgesia as compared to a lower dose (4mg), in contrast to study done by Tandoc M.N. 11 who found there was no difference in the duration of analgesia and motor block between low dose and high dose dexamethasone groups. This is probably because of higher dose of bupivacaine(40ml) used in their study.

CONCLUSION:
In conclusion, addition of dexamethasone to local anaesthetics in supraclavicular brachial plexus block results in a faster onset and prolonged duration of sensory and motor blockade. Higher dose(8mg) of dexamethasone is more efficacious than lower dose(4mg) of dexamethasone as an adjuvant with local anaesthetics.

REFERENCE

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 pharmocol 2009; 25:285-8. | 2. Honorio T. Benzon, Epidural steroids. In P Prithvi Raj. Pain medicine, a comprehensive review. Mosby publication 1999 page 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 bracial plexus block with and without Dexamethasone – A Comparative Study. International Jr of Scientific and research publications Dec 2012,Volume 2,Issue 12. | 6. Curley J, Castillo J, Hotz J, Uezono M, Hernandez S, LimJ, et al. Prolonged regoinal 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. |