

Intravenous Dexamethasone As Adjuvant to Axillary Brachial Plexus Blockade For Forearm Orthopedic Surgeries: A Randomized Controlled Trial

Dhananjaya Kumar SM¹, Shankara Narayana P²

¹Postgraduate, ²Professor, Department of Anaesthesia, Yenepoya Medical College & Hospital, Mangalore, Karnataka 575018, India.

Abstract

Introduction: perineural dexamethasone prolongs the duration of single injection peripheral nerve block when added to the local anesthetic solution while perineural use of dexamethasone remains off-label. Postulated systemic mechanisms of action along with safety concerns have prompted the investigation of intravenous dexamethasone as an alternative. *Aim:* We aimed to confirm that addition of intravenous dexamethasone will prolong the duration of analgesia after single shot axillary brachial plexus block compared to conventional long acting local anesthetic alone. *Material And Method:* 46 Asa I to III adult patients scheduled for elective forearm and hand surgeries were randomly allocated to 2 groups of 23 patients each. Patients in group D received axillary brachial plexus block with injection of 30 ml bupivacaine 0.5% and 2 ml of dexamethasone (8mg) IV and Patients in control group A received axillary brachial plexus block with injection of 30 ml of bupivacaine 0.5% and 2ml of 0.9% saline IV prior to surgery. *Results:* There was a statistically significant difference in duration of post operative analgesia, duration of motor and sensory blockade and better overall patient satisfaction in group D when compared to group A. *Conclusion:* We concluded that Single shot axillary brachial plexus block with 0.5% bupivacaine and intravenous dexamethasone resulted in prolonged duration of post operative analgesia, sensory and motor blockade and better patient satisfaction

Keywords: Intravenous dexamethasone, Brachial plexus block, Axillary brachial plexus block.

How to cite this article:

Dhananjaya Kumar SM, Shankara Narayana P. Intravenous Dexamethasone As Adjuvant to Axillary Brachial Plexus Blockade For Forearm Orthopedic Surgeries: A Randomized Controlled Trial. Indian J Anesth Analg. 2020;7(3):734-738

Introduction

Optimization of postoperative pain control plays an important role in the outcome of orthopedic surgeries, permitting early rehabilitation and accelerating functional recovery.¹ Pain control after surgeries on upper limb can be especially difficult to achieve and this may complicate postoperative care. Pre-operative local anesthetic

brachial plexus blockade significantly reduces postoperative discomfort, and can reduce opiate consumption.² Dexamethasone is a useful adjuvant in regional anesthesia that is used to prolong the duration of analgesia for peripheral nerve blocks. Recent randomized controlled trials (RCTs) have demonstrated conflicting results as to whether perineural versus intravenous (IV) administration of dexamethasone as an adjuvant to local anaesthetic

Corresponding Author: Shankara Narayana P, Professor, Department of Anaesthesia, Yenepoya Medical College & Hospital, Mangalore, Karnataka 575018, India.

E-mail: : dhananjaymedappa@gmail.com

Received on 20.02.2020, **Accepted on** 07.03.2020

brachial plexus blockade is superior in this regard, and the perineural use of dexamethasone remains off-label. The use of additives such as vasoconstrictors, clonidine, ketamine and steroids to local anesthetics to prolong the duration of a single-shot axillary nerve block have been studied, but most of them failed to prolong the duration of peripheral nerve blocks.³ We, therefore, conducted a prospective, double blind, randomized controlled study to evaluate the effect of intravenous dexamethasone on the duration of a single-shot axillary nerve block with bupivacaine 0.5% for postoperative analgesia after forearm orthopedic surgeries.

Materials and Methods

After obtaining approval from the institutional ethics committee and written informed consent, 46 adult patients of American Society of Anesthesiologists physical status I to III scheduled for elective orthopedic surgeries on forearm and hand receiving axillary brachial plexus block were selected. Patients with uncontrolled diabetes, pregnant and lactating mothers, patients having contraindication to axillary nerve block (coagulopathy, local infection or axillary lymphadenopathy) and patient refusal or inability to consent were excluded from the study. On the day of surgery, patients were allocated into two groups (Group D and Group A) at random and in equal ratio using closed envelope method. After randomization is done, Drug preparation will be done by another anaesthesiologist who is not involved in the study.

Patient was connected with monitors such as ECG, pulse oximetry and non invasive arterial pressure and sedated with intravenous midazolam at increments of 0.5 mg up to maximum of 3mg. after skin disinfection and infiltration with lidocaine 1%, the axillary brachial plexus was identified using a linear 6-13 MHz ultrasound probe. We inserted a short bevel 50mm, 22 gauge stimulating needle connected to a nerve stimulator. The initial setting was a current of 0.8 mA with a stimulating frequency of 2 Hz. Contractions of any forearm or hand muscles indicated correct placement of needle and drug preparation was injected. The block was performed by resident physicians under supervision of anesthesiologist. Patients in group D received axillary brachial plexus block with injection of 30 ml bupivacaine 0.5% and 2 ml of dexamethasone (8mg) IV and Patients in control group A received axillary brachial plexus block with injection of 30 ml of bupivacaine 0.5% and 2ml of 0.9% saline IV. All patients subsequently underwent planned elective orthopedic surgeries. Intra operatively opioid

medications were avoided. All Patients were given standardized post operative pain management regimen (intravenous paracetamol 15 mg/kg when VAS score > 4). Duration of analgesia defined as the time between performance of the block and the first analgesic request was designated as the primary outcome was documented. Motor and sensory block duration (strength score; 3 point motor block score MBS and pain scores (VAS) assessed at four time points 8th, 12th, 16th and 20th hour) were noted and documented, administration of ‘rescue’ analgesic medication (IV Paracetamol) in the first 24 h if given any were noted, patient satisfaction with overall pain management on a 0-10 scale at 24th hour was recorded and tabulated. Recovery room discharge criteria were assessed such as stable vital parameters, absence of nausea and VAS score less than 3 and motor blockade score more than 2 and patient was discharged after they met recovery room discharge criteria. Proportions were compared by using the Pearson chi - square test; Fisher’s exact test was used instead of the Pearson chi-square test if the minimum expected cell count was less than five. Duration of blockade was analysed by using Cox Regression proportional hazard method.

Results

A total of 46 patients were enrolled in the study and distribution of patients according to gender and sex are shown in Table 1.

The axillary brachial plexus block along with dexamethasone IV (group D) as adjuvant lasted longer period when compared to axillary brachial plexus block with saline IV as adjuvant (group A) where *p* value < 0.001, Table 2. However, the difference among analgesic consumption (1.7g ± 0.58g vs 1.4g ± 0.43g) and patient satisfaction (8.5 ± 0.7 vs 7.9 ± 0.6) were also statistically significant among two groups (Table 3 and Graphs 1-4).

Table 1: Group Statistics of age

	Group			
	D		A	
	Mean	Std. Deviation	Mean	Std. Deviation
Age	46.61	11.965	45.48	12.820

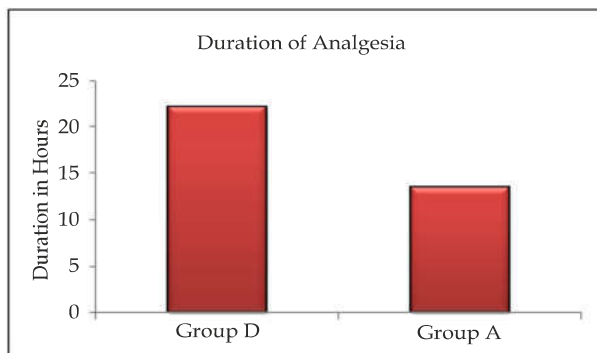
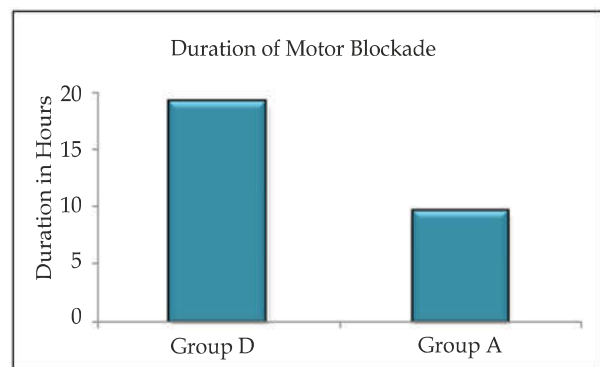
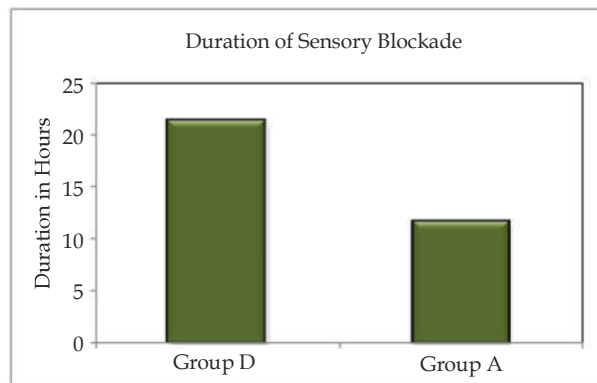
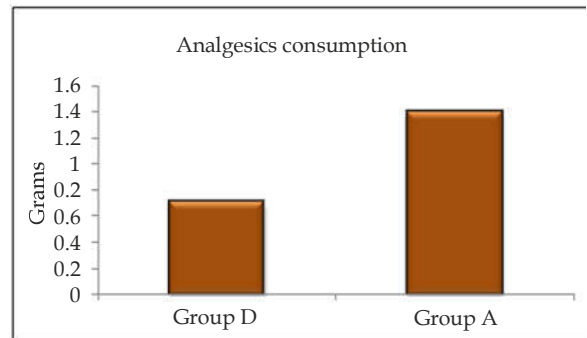
Table 2: Group statistics of gender

	Group	Sex		Total
		F	M	
		D	11 47.8%	
A	11 47.8%	12 52.2%	23 100.0%	

Table 3: Primary and secondary outcomes following forearm and hand surgeries

	Group				
	D		A		<i>p</i> -value
	Mean	Std. Deviation	Mean	Std. Deviation	
Duration of Analgesia	22.13	2.768	13.39	1.588	<0.001
Duration of Sensory Blockade	21.26	4.059	11.57	1.441	<0.001
Duration of Motor Blockade	19.04	3.444	9.52	1.410	<0.001
Analgesics Consumption(in g)	0.696	0.357	1.391	0.4252	0.048
Patient Satisfaction 0-10 scale	8.52	0.730	7.96	0.638	0.008

$p < 0.05$ indicates significant difference between the groups

**Graph 1:** Comparison between group D and group A of duration of analgesia**Graph 3:** Comparison between group D and group A of duration of motor blockade**Graph 2:** Comparison between group D and group A of duration of sensory blockade**Graph 4:** Comparison between group D and group A of analgesic consumption

Discussion

This clinical trial builds on a limited number of studies examining the efficacy of systemic

dexamethasone administered at the time of upper extremity regional block compared with perineural administration of the drug in the block anaesthetic solution⁴.

Table 4:

	Post operative analgesia	Sensory and motor blockade	Analgesic consumption and Patient satisfaction
Present study	22.13 ± 2.768, statistically significant with <i>p</i> value of <0.001	21.26 ± 4.059, statistically significant with <i>p</i> value of <0.001 19.04 ± 3.444, statistically significant with <i>p</i> value of <0.001 respectively	Paracetamol (0.696 ± 0.357), statistically significant with <i>p</i> value of <0.048 and patient satisfaction scale (8.52 ± 0.730), statistically significant with <i>p</i> value of <0.008).
Choi and colleagues ⁵ in 2015 conducted meta-analysis on perineural dexamethasone as an adjuvant	Prolonged analgesic duration to 21.76 hours from 12.17 hours.	Motor blockade duration 18.37 hours from 11 hours.	No statistically significant on analgesic consumption.
Desmet and his colleagues ⁷ in 2015, RCT of IV dexamethasone 1.25mg, 2.5mg, 10mg and IV saline.	12.2 hours with IV saline, prolonged to 17.4 hours (dexamethasone 10mg), 20.1 (2.5mg dexamethasone) hours, 14 hours (1.25mg dexamethasone) respectively		
M. Desmet and colleagues ⁴ in 2013, RCT on IV vs perineural dexamethasone	perineural and IV dexamethasone were 23.41 hours and 21.25 hours respectively		Paracetamol consumption was 2.6g in perineural vs 2.3g in IV dexamethasone.
Rosenfeld and colleagues ⁶ in 2016, RCT on perineural vs IV dexamethasone	perineural (16.9 hours) vs IV (18.2 hours) IV dexamethasone (25 hours) vs IV saline (13.2 hours) vs perineural (25 hours)	Motor blockade was IV dexamethasone (30.1 hours) vs perineural dexamethasone (25.5 hours) vs IV saline (19.7 hours).	opioid consumption in perineural (12.2 mg) vs IV (17.1 mg) IV dexamethasone and perineural dexamethasone had reduced opioid consumption and better patient satisfaction.

In our study, we found that duration of analgesia was prolonged in pts who received dexamethasone as an adjuvant along with axillary brachial plexus block when compared to control group. Secondary outcomes in our study such as motor and sensory blockade were prolonged in pts who received IV dexamethasone along with axillary brachial plexus block when compared to sole axillary brachial plexus block. Analgesic consumption during first 24 hrs was lesser when compared to control group. Overall patient satisfaction was better in IV dexamethasone group when compared to control group and was statistically significant (Table 4).

Conclusion

We concluded that single shot axillary brachial plexus block with 0.5% bupivacaine and intravenous dexamethasone resulted in prolonged duration of post operative analgesia, sensory and motor blockade and better patient satisfaction.

References

1. Capdevila X, Barthelet Y, Biboulet P, et al. Effects of perioperative analgesic technique on the surgical outcome and duration of rehabilitation after major knee surgery. *Anesthesiology: The Journal of the American Society of Anesthesiologists* 1999 Jul 1;91(1):8-15.
2. Singelyn FJ, Lhotel L, Fabre B. Pain relief after arthroscopic shoulder surgery: a comparison of intraarticular analgesia, suprascapular nerve block, and interscalene brachial plexus block. *Anesthesia & Analgesia* 2004 Aug 1;99(2):589-92.
3. Brummett CM, Williams BA. Additives to local anesthetics for peripheral nerve blockade. *International anesthesiology clinics* 2011;49(4):104.
4. Desmet M, Braems H, Reynvoet M, et al. I.V. and perineural dexamethasone are equivalent in increasing the analgesic duration of a single-shot interscalene block with ropivacaine for shoulder surgery: a prospective, randomized, placebo-controlled study. *Br J Anaesth* 2013;111(3):445-452.

5. Choi S, Rodseth R, McCartney CJ. Effects of dexamethasone as a local anaesthetic adjuvant for brachial plexus block: a systematic review and meta-analysis of randomized trials. *British journal of anaesthesia* 2014 Mar 1;112(3):427-39.
6. Rosenfeld DM, Ivancic MG, Hattrup SJ, et al. Perineural versus intravenous dexamethasone as adjuncts to local anaesthetic brachial plexus block for shoulder surgery. *Anaesthesia*. 2016 Apr;71(4):380-8.
7. Desmet M, Vanneste B, Reynvoet M, et al. A randomised controlled trial of intravenous dexamethasone combined with interscalene brachial plexus blockade for shoulder surgery. *Anaesthesia*. 2015 Oct;70(10):1180-5.
8. Abdallah FW, Johnson J, Chan V, et al. Intravenous dexamethasone and perineural dexamethasone similarly prolong the duration of analgesia after supraclavicular brachial plexus block: a randomized, triple-arm, double-blind, placebo-controlled trial [published correction appears in *Reg Anesth Pain Med*. 2015 Jul-Aug;40(4):398]. *Reg Anesth Pain Med* 2015;40(2):125-132.
9. Vieira PA, Pulai I, Tsao GC, et al. Dexamethasone with bupivacaine increases duration of analgesia in ultrasound-guided interscalene brachial plexus blockade. *European Journal of Anaesthesiology (EJA)* 2010 Mar 1;27(3):285-8.
10. Aliste J, Leurcharusmee P, Engsusophon P, et al. A randomized comparison between intravenous and perineural dexamethasone for ultrasound-guided axillary block. *Canadian Journal of Anesthesia/ Journal canadien d'anesthésie* 2017 Jan 1;64(1):29-36.
11. Pathak RG, Satkar AP, Khade RN. Supraclavicular brachial plexus block with and without dexamethasone-a comparative study. *International Journal of Scientific and Research Publications*. 2012 Dec;2(12):1.
12. Chong MA, Berbenetz NM, Lin C, Singh S. Perineural versus intravenous dexamethasone as an adjuvant for peripheral nerve blocks: a systematic review and meta-analysis. *Reg Anesth Pain Med* 2017 May 1;42(3):319-26.
13. Chun EH, Kim YJ, Woo JH. Which is your choice for prolonging the analgesic duration of single-shot interscalene brachial blocks for arthroscopic shoulder surgery? intravenous dexamethasone 5 mg vs. perineural dexamethasone 5 mg randomized, controlled, clinical trial. *Medicine* 2016 Jun;95(23).
14. Engsusophon P, Arnuntasapakul V, Tiyaprasertkul W, et al. A multicenter randomized comparison between intravenous and perineural dexamethasone for ultrasound-guided infraclavicular block. *Regional anesthesia and pain medicine* 2016 May;41(3):328-33.

