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A prospective randomised study of adjuvants for supraclavicular brachial plexus block: Clonidine vs Dexamethasone

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ABSTRACT

Introduction: Supraclavicular brachial plexus block is among foremost technique of regional anaesthesia administered during upper-limb surgery. Different adjuvants have been used with varied results for prolonging the sensory and motor blockade. Dexamethasone and Clonidine have been established as suitable adjuvants for blocks. Adding adjuvants to local anaesthetic drugs in nerve blocks has many benefits. We studied performance of dexamethasone or clonidine as additives to local anaesthetic in subclavian perivascular block as a part of upper limb surgery. Aim was to ascertain which of them is a better adjuvant. **Materials and Methods:** Study population was randomized to 2 groups of 50 patients each. Group 1 was given 5 ml of 2% lignocaine and 15 ml 0.5% bupivacaine with 8mg dexamethasone. Group 2 received 5ml 2% lignocaine and 15 ml 0.5% bupivacaine with 0.150 mg clonidine. Time to establishment of sensory & motor block, duration of analgesia and any adverse effects were observed. Statistical analysis was done with SPSS 13.0. Quantitative variables were assessed using student t test. Qualitative variables were analysed using Chi square test. P value < 0.05 was defined as significant.

Results: Onset of sensory blockade was at 7.23±4.24 in group 1 and 8.36±2.68 minutes in Group 2. Average time to motor block was at 8.48±3.22 minutes in Group 1 and 9.58±3.71 minutes in Group 2. Analgesia's duration in Group 1 and Group 2 was 998.2±338.5 and 879.3±284.5 minutes respectively. No major adverse events were seen in either group.

Conclusion: Performance of dexamethasone was similar to clonidine as adjunct to local anaesthetic in subclavian perivascular approach of brachial plexus block. However, it has faster sensory and motor blockade's onset. Analgesia's duration observed was found to be longer, though the difference was statistically insignificant.

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1. Introduction

The supraclavicular brachial plexus block is an efficient and reliable technique for regional anaesthesia to intact upper limb. Clonidine is being used as an adjunct to local anaesthetic agents in various anaesthesia techniques to prolong the effect of block. The results of previous studies on efficiency of clonidine in brachial plexus block have variable. It's established by various studies that

clonidine enhances the effects of local anaesthetic drugs.¹ Excellent anaesthesia & favourable surgical conditions make it a widely accepted method. Key features of the block include rapid onset, opaque anaesthesia.² Nerve blocks avoid unwanted adverse effects of the intravenous and inhalational drugs given in general anaesthesia. It also avoids laryngoscopic stress seen with endotracheal intubation. There is also decreased perioperative opioid requirement.³ Many drugs were tried as adjuvants in supraclavicular nerve blocks. Different drugs like opioids (e.g. Fentanyl and Buprenorphine) that were used as

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adjuncts were found to create respiratory depression and psychomimetic effects.³ Additives with least adverse events are hence being studied. Dexamethasone is steroidal compound, prednisolone's derivative and an isomer of betamethasone. It's an easily available drug.⁴ Clonidine is a centrally acting α -adrenergic 2 agonist. It has analgesic properties when administered along with local anaesthetic drugs used in regional anaesthesia techniques like epidural, intrathecal or peripheral blocks.⁵ Current study aimed at assessing the dexamethasone or clonidine as adjuvant to local anaesthetic in subclavian perivascular block.

2. Materials and Methods

This prospective, randomized study was conducted at tertiary care centre. The study was approved by the Institutional Ethics Committee. All participants signed written informed consent. 100 patients, ASA physical status I-III, 18 years of age or older, weighing between 30-80 kg undergoing surgery of the upper limb, were enrolled. Patients for whom supraclavicular brachial plexus block or the study medications were contraindicated or those who had a history of significant neurological, psychiatric, neuromuscular, cardiovascular, pulmonary, renal or hepatic disease or alcohol or drug abuse, as well as pregnant or lactating women were excluded from the study. Patients already on drugs with psychotropic or adrenergic activities and patients receiving chronic analgesic therapy were also excluded. No other sedative medication was administered in the first hour after injecting the study dose. The patients were randomized into 2 groups using computer generated random numbers by using winpepi software as Group 1 and Group 2. Intravenous cannulation was done in the opposite arm using 18 G cannula. Anxiolysis was obtained with Inj. midazolam 1.0 mg intravenously. Parameters observed were electrocardiogram (ECG), heart rate; non-invasive blood pressure (NIBP) and oxygen saturation (SpO₂) using pulse oxymetry. Supraclavicular block was then performed under ultrasound guidance. In plane technique was used after proper visualization of the brachial plexus. Group 1 received 5 ml 2% lignocaine with adrenaline and 15 ml 0.5% bupivacaine with 8mg dexamethasone and Group 2 received 5 ml 2% lignocaine with adrenaline and 15 ml 0.5% bupivacaine with 0.150 mg clonidine. The block was assessed for onset of sensory and motor blockade and duration of analgesia. Onset of sensory blockade was the time in minutes between injection and complete abolition of pin prick response in 3 nerve areas (Median, Radial and Ulnar nerves). Onset of motor block was the time in minutes between the drug injection and complete absence of voluntary movement of the limb. Anaesthesia in only some dermatomal areas was termed as patchy block and in failed block there was no block at all. Wait time was at least 30 minutes to declare a failed block. In patchy and failed block patient's surgery was preceded with general

anaesthesia. The average duration of surgery was 2 hours. Visual Analogue Score (VAS) was used for assessment of analgesia. Duration of analgesia was the time in minutes between onset of sensory blockade and reappearance of considerable pain as assessed by (VAS score >3) and demand for rescue analgesics. Fentanyl in the dose of 3mcg/kg was used as a rescue analgesic. Any significant hemodynamic changes, sedation, drug adverse effects and block related complications were looked for. Demographic data and onset of sensory and motor block and duration of analgesia were compared between the two groups. Statistical analysis of the data collected was done by chi square test and t-test using the computer online software www.epi.com. P values <0.05 was considered as statistically significant.

3. Results

Study enrolled 105 patients of which 5 patients were disqualified in view of failed/patchy block. Remaining 100 patients were analysed. Two groups were similar in respect to age and weight (Table 1).

Table 2 summarises analysis of effect of block. Sensory and motor blockade's onset was faster in Group 1 (7.23 minutes and 8.48 minutes) as compared to Group 2 (8.36 minutes and 9.58 minutes respectively), p value 0.117 and 0.116. Rapid sensory and motor blockade was found in Group 1; though the difference was not statistically significant. The length of analgesia was 998.2 minutes in Group 1 and in Group 2 was 879.3 minutes. Dexamethasone had longer duration of analgesia; p value being 0.06. No adverse effects were seen in group 1 patients. Two patients in group 2 had bradycardia which was immediately resolved with injection Atropine 1 ampoule intravenously. Five patients in group 2 made complaints of nausea which was treated with Injection ondansetron 4mg intravenously. Two patients in group 2 were sedated but were easily arousable. No major side effects were noted in both the groups. There were no block related complications in either of the groups.

4. Discussion

Supraclavicular blocks are performed at level of the brachial plexus trunks. Almost entire sensory, motor and sympathetic innervations of the upper extremity are located in three nerve structures (trunks), restricted within small surface area. Therefore, this block has fast onset, predictable and dense blockade and good success rate.⁶ In this study, we compared clonidine and dexamethasone as adjuvants. We found that by adding dexamethasone to bupivacaine, onset of sensory block and the duration of analgesia can be mildly increased but the results were statistically insignificant when compared with clonidine and also the onset of motor blockade was faster with dexamethasone than clonidine. Even if injecting clonidine as the individual

Table 1: Age and weight of patients

	Group 1	Group 2	P Value
Age (Years)	33.39±13.10	32.84±12.36	>0.05
Weight (KG)	54.12±15.61	55.07±14.89	>0.05

Values expressed as mean ± SD.

Table 2: Block characteristics

	Group 1		Group 2		P Value
	Mean	SD	Mean	SD	
Onset of sensory blockade (minutes)	7.23	4.24	8.36	2.68	0.117
Onset of Motor Blockade (minutes)	8.48	3.22	9.58	3.71	0.116
Duration of analgesia (minutes)	998.2	338.5	879.3	284.5	0.06

analgesic into the brachial plexus sheath does not provide clinically related analgesia, it has been confirmed to slow down the action potential of A and C fibers in de-sheathed sciatic nerves.⁷ Clonidine being a lipophilic drug, much gets absorbed systemically after perineural administration resulting in sedation. Some studies reported significant sedation with use of clonidine rather with plain local anaesthetic. Sedation was not assessed in this study as all patients were administered the premedication with midazolam and therefore could alter the outcome.^{8,9} In the current study, Dexamethasone was more effective as adjunct to local anaesthetic when compared with clonidine. We noted that by adding dexamethasone, the onset of sensory and motor blockade was faster. The duration of analgesia was prolonged and thereby reducing the need for postoperative opioid and NSAID use although it was not statistically significant. Many other studies have also indicated that dexamethasone added with bupivacaine prolongs the duration of analgesia.¹⁰ Low- to moderate-quality evidence suggests that when used as an adjuvant to peripheral nerve block in upper limb surgery, both perineural and intravenous dexamethasone may prolong duration of sensory block and are effective in reducing postoperative pain intensity and opioid consumption.¹¹ Zhang et al.¹² found addition of combined perineural dexmedetomidine and dexamethasone to ropivacaine for intercostal nerve block seemed to be an attractive method for prolonged analgesia with almost no adverse effects. Saied et al.¹³ claimed that for brachial plexus blocks, epinephrine did not affect the duration of analgesia when added to ropivacaine. Epinephrine did not enhance the observed increase of block duration induced by clonidine or the combination of clonidine and dexamethasone. The most block duration enhancement was observed when combination of clonidine and dexamethasone were added to ropivacaine. Our study summarizes that the addition of dexamethasone with bupivacaine enhances the supraclavicular brachial plexus block quality in upper

limb surgeries by a more rapid onset and increased duration of sensory and motor blockade, improving post-operative analgesia. Using a fixed dose of clonidine and dexamethasone was the main limitation of the study.

5. Conclusion

The study suggests that dexamethasone and clonidine are effective adjuncts to local anaesthetics in supraclavicular brachial plexus block. Though we could not prove significant difference in using one over the other in all block perspectives, dexamethasone added to bupivacaine is an excellent option for improving the quality and duration of supraclavicular brachial plexus block in upper limb surgeries.

6. Source of Funding

None.

7. Conflict of Interest

The authors declare no conflict of interest.

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