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Original Research Article

Evaluation of dexmedetomidine as adjuvant to 0.5% ropivacaine in comparison to dexamethasone in supraclavicular block

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ABSTRACT

Background: There are many adjuvants imparting great efficacy and safety to the anaesthetic process. Drugs like steroid, alpha-2 agonist, opioid, epinephrine, midazolam, and naloxone are certain adjuvants used for potentiating block. The aim of the study was to compare the effect of dexmedetomidine and dexamethasone as adjuvant to ropivacaine on various postoperative parameters.
Methods: All the patients were scheduled for elective surgery for forearm and hand under USG guided supraclavicular block. The randomisation was achieved by using block randomisation technique. The patients were randomly divided in to two groups. Group DM were received 15 ml of 0.5% ropivacaine with 100 µg one ml dexmedetomidine and group DS were received 15 ml of 0.5% of ropivacaine with 8 mg dexamethasone. Drug solution was prepared by same individual and was not part of study. Parameters observed were onset of motor block, onset of sensory block, duration of sensory block, duration of motor block.
Results: The mean duration of analgesia was significantly prolong in dexmedetomidine (group DM) than dexamethasone group (DS) (1142.47±28.32 min vs 1045.95±78.55 min). Time for first rescue analgesic requirement was significantly prolong in dexmedetomidine (group DM) than dexamethasone group (DS) (17.44±2.41 hour vs 13.54±1.98 hours).
Conclusions: The duration of sensory and motor block was significantly prolonged in Group DM as compared to Group DS. We have observed that the mean duration of analgesia was significantly prolonged in dexmedetomidine than dexamethasone group. Time for first rescue analgesic requirement was significantly prolonged in dexmedetomidine than dexamethasone group. There was no difference in adverse drug reaction between two groups

Keywords: Dexmedetomidine, Dexamethasone, Ropivacaine, Supraclavicular block

INTRODUCTION

Regional anaesthesia technique has been used as alternative or adjuvant to general anaesthesia. Supraclavicular block is a regional anaesthesia technique first introduced in 1911 by Kulenkampff based on land mark based approach using novocain-adrenalin solution.[1,2] This approach was associated with complication like vascular injury, pneumothorax and drug allergy. With the utilisation of modern imaging technique and safe and effective drug supraclavicular block has become popular technique for upper limb surgery.[3] In this procedure local anaesthetics are injected in to the vicinity of a specific nerve or bundle of nerves so that sensation coming from specific region of body gets blocked. But the block produced by single injection of local anaesthetics are not sufficient to prolong the effect of anaesthesia.[4,5] To address this problem a multimodal perineural analgesia approach is used with adjuvant having different mechanism of action.[6,7] There are many adjuvants imparting great efficacy and safety to the anaesthetic process. Drugs like steroid, alpha-2 agonist, opioid, epinephrine, midazolam, and naloxone are certain adjuvants used for potentiating block.[8] Dexmedetomidine is a highly selective alpha-2 adrenergic receptor agonist used as neuraxial adjuvant

that decreases the intensity and increases the duration of pain. It also accelerates the onset of sensory block.[9] Dexamethasone has been evaluated as adjuvant to local anaesthetics and has been found to increase the duration of analgesia, faster onset of analgesia, sensory and motor block.[10] After literature review we have came to conclusion that studies are available regarding comparison of dexamethasone and dexmedetomidine as adjuvant to regional anaesthesia.

Gao et al has reported that Using dexmedetomidine (1 µg/kg), instead of dexamethasone (10 mg), as an adjuvant of ESPB with ropivacaine, prolonged sensory block duration, provided effective acute pain control, and required lesser rescue analgesia and shorter hospital stay.[11] Lee et al has reported that Dexamethasone 10 mg and dexmedetomidine 100 µg were equally effective in extending the duration of ropivacaine in ultrasound-guided axillary BPB with nerve stimulation.

However, neither drug has significantly effects the onset time. Based on conclusion of above studies present study has been designed to compare the effect of dexmedetomidine and dexamethasone as adjuvant to ropivacaine on various postoperative parameters.

METHODS

This was a randomised, prospective comparative observational study conducted in the department of anaesthesiology Rangaraya medical science Kakinada Andhra Pradesh from November 2018 to December 2021.

Subjects

Patients were enrolled for this study based on following inclusion and exclusion criteria.

Inclusion criteria

Patients with age 18 to 60 years; both sex and those in ASA Class I and II were included.

Exclusion criteria

Patients with cardiovascular disorder; COPD; pregnant; and those with coagulation disorders were excluded.

Sample size

Sample size was calculated by considering 20% increasing in duration of analgesia as clinical relevant, assuming an α- error 0.05 and power of study to be 80%. Sample size was calculated to 52. For this calculation clicalc.com sample size calculator was used.[13,14]

Method

During our study period 104 patients scheduled for forearm surgery under supraclavicular block were enrolled for this study. The patients were explained in detail regarding the study and the procedures that would be done. All the patients were scheduled for elective surgery for forearm and hand under USG guided supraclavicular block. The randomisation was achieved by using block randomisation technique. The patients were randomly divided in to two groups. Group DM were received 15 ml of 0.5% ropivacaine with 100 microgram one ml dexmedetomidine and group DS were received 15 ml of 0.5% of ropivacaine with 8 mg dexamethasone. Drug solution was prepared by same individual and was not part of study.

All the patient were examined clinically in the pre-operative period and all the basic lab investigation was done like Haemoglobin estimation, total leukocyte count, differential count, platelets, renal and liver function test, electrolytes sodium, and potassium, electrocardiogram, chest X-ray- PA view.

In the operation theatre ECG (electrocardiogram), non-invasive blood pressure monitoring and pulse oximeter was applied. Base line vital parameters were recorded and intravenous access was secured with 18 g cannula in opposite limbs. Under all aseptic condition supraclavicular block was performed under ultrasound guided technique using liner probe. After placing the block, heart rate, and oxygen saturation was continuously monitored, blood pressure was measured intermittently, every 15 min.

Parameters observed were onset of motor block, onset of sensory block, duration of sensory block, duration of motor block. The onset time of sensory block and motor block was calculated as time between the end of the drug injection and no response to the pin prick test and complete paralysis.

Duration of sensory block was defined as from the time of onset of sensory blocked till the time at which the pin prick sensation returned at the three terminal nerves namely ulnar, median and radial nerve similarly duration of motor block was defined as from the time of onset of motor blocked till the time at which the patients were able to move their fingers.

Sensory block was accessed by using pin prick method with the help of blunt 23 g needle in the distribution of all four nerves and grading was done by Hollmen score as follows (a) 1= normal sensation; (b) 2= weaker in comparison to the opposite side; (c) 3= prick recognised as blunt touch as other side; and (d) 4= no sensation.[15] Motor block was evaluated by thumb adduction for ulnar nerve, thumb opposition for medium nerve, thumb abduction for radial nerve and pronation of arm for evaluation of motor block modified Bromage score was used.[16] Post-operatively pain scores were recorded by visual Analogue score between 0 to 10. (0= no pain; 1=mild annoying pain; 4= nagging uncomfortable troublesome pain; 8= intense dreadful pain; 10=worst

possible pain).[17] Rescue analgesia was given, once VAS was more than 4 and was provided in the form of injection tramadol 2 mg/kg intravenously.

Ethics

This study is approved by institutional ethics committee and written informed consent was taken from patients before start of study.

Statistical analysis

Data were recorded in excel sheet and statistical Analysis was done with software SPSS-14 version. Qualitative data were calculated as percentage and proportions and were analyzed by Chi-square test. Quantitative data were expressed as mean±SD and these data were analyzed by unpaired student t test. The P value less than 0.05 were taken as significant

RESULTS

During our study period 102 patients scheduled for upper limb surgery under supraclavicular block were enrolled for this study. As per Table 1, mean age of patients in group DS was 40.35±12.44 years and in group DM it was 39.5±10.15 years. Both group were comparable to each other statistically (p=0.40). Both group were similar to each other with respect to sex distribution. Mean BMI of patients in group DS was 24.21±2.85 kg/m^2 and in group DM it was 23.94±1.89 kg/m^2. Both group were comparable to each other statistically (p=0.24). Mean duration of surgery in group DS was 77.24±11.54 min and in group DM it was 80.22±9.14 min. Both group were comparable to each other statistically (p=0.07). Both group of patients were comparable to each other with regards to ASA score (p=0.66). The time of onset of sensory and motor block was significantly early in dexmedetomidine group than dexamethasone group. The mean of time of onset of sensory block in group DS was 12.11±3.41 min as compared to 10.14±2.98 min in group DM. The mean of time of onset of motor block in group DS was 17.06±3.87 min as compared to 13.55±4.02 min in group DM. The duration of sensory and motor block was significantly prolonged in group DM as compared to group DS. The duration of sensory block was 686.61±54.22 min in group DS and 754.44± 40.22 min in group DM. The duration of motor block was 702.52±78.76 min in group DS and 844.53±35.84 min in group DM.

Table 1: Comparison of demography between two groups.

Variables		Group DS (N=52)	Group DM (N=52)	P value
Age		40.35±12.44	39.5±10.15	0.40
Sex	M	34	30	0.42
	F	18	22	
BMI (kg/m^2)		24.21±2.85	23.94±1.89	0.24
Duration of surgery (min)		77.24±11.54	80.22±9.14	0.07
ASA score (I /II)		38	36	0.66
		14	16	

Table 2: Comparison of sensory and motor block characteristics.

Parameters (min)	Group DS (N=52)	Group DM (N=52)	P value
Time of onset of sensory block	12.11±3.41	10.14±2.98	0.03
Time of onset of motor block	17.24±3.87	13.55±4.02	0.02
Duration of sensory block	686.61±54.22	754.44±40.22	0.0001
Duration of motor block	702.52±32.14	844.23±35.84	0.0001

Table 3: Duration of analgesia and time for first rescue analgesia in both groups.

Parameters	Group DS (N=52)	Group DM (N=52)	P value
Mean duration of analgesia (min)	1045.95±78.55	1142.47±28.32	0.00001
Time for first rescue analgesic requirement (hours)	13.54±1.98	17.44±2.41	0.00001

The mean duration of analgesia was significantly prolong in dexmedetomidine (Gr DM) than dexamethasone group (Gr DS) (1142.47±28.32 min versus 1045.95±78.55 min).

Time for first rescue analgesic requirement was significantly prolong in dexmedetomidine (Gr DM) than dexamethasone group (r DS) (17.44±2.41 hours versus 13.54±1.98 hours). There was no difference in adverse drug reaction between two groups. Sedation and hypotension was common in dexmedetomidine group.

Table 4: Comparison of adverse effects.

Parameters	Group DS (N=52)	Group DM (N=52)
Nausea	1	0
Vomiting	1	1
Sedation	0	4
Hypotension	1	3
Bradycardia	1	1

DISCUSSION

Adjuvants are drug used for onset and duration of analgesia and counteract disadvantageous effects of local anaesthetics. Various opioid and non-'opioid drugs are used as adjuvant.[19] In present study we have evaluated dexmedetomidine and dexamethasone as adjuvant to ropivacaine in supraclavicular block.

In this randomized double blind placebo controlled study we have compared the effect of 1 ml (100 µg) dexmedetomidine and dexamethasone 8 mg to 30 ml of 0.5% ropivacaine on onset and duration of sensory and motor block and duration of postoperative analgesia. Both groups are comparable to each other with respect to age, sex, and body mass index, duration of surgery and ASA score. This corroborates with the study of Adinarayanan et al.[19,20] Gao et al has reported that Using dexmedetomidine (1 µg/kg), instead of dexamethasone (10 mg), as an adjuvant of ESPB with ropivacaine, prolonged sensory block duration, provided effective acute pain control, and required lesser rescue analgesia and shorter hospital stays.[11] This conclusion corroborates with our study. Adinarayanan et al dexamethasone significantly extends the duration of supraclavicular brachial plexus block compared to dexmedetomidine. Both the above two adjuvants are effective in decreasing the postoperative morphine consumption.[19] This finding does not support our study.

We have observed that the mean duration of analgesia was significantly prolong in dexmedetomidine than dexamethasone group. Time for first rescue analgesic requirement was significantly prolonged in dexmedetomidine than dexamethasone group. Elham et al both dexmedetomidine and caudal dexamethasone added to local anaesthetics are good alternatives in prolongation of postoperative analgesia with less pain score compared to caudal local anaesthetic alone or added to fentanyl. This finding corroborates with our study.[21]

Singh et al has reported that both dexmedetomidine and dexamethasone as adjuvants to ropivacaine help in early onset of sensory and motor block. On comparison between these two adjuvants, we found no notable difference in our study.[22] This study does not support our study.

Albrecht et al in his meta-analysis concluded that dexamethasone may be a superior adjunct; it improves the duration of analgesia by a statistically significant increase, albeit clinically modest, equivalent to 2.5 hours more than dexmedetomidine, without the risks of hypotension or sedation. Future direct comparisons are encouraged.[23] This study contradicts our finding. Dash et al has reported that Dexmedetomidine provided prolonged relief from suffering after utilizing it in form of an additive to SCBP portion's ropivacaine when compared to dexamethasone.[20] This finding corroborates with our study.

CONCLUSION

From present study we can conclude that the time of onset of sensory and motor block was significantly early in dexmedetomidine group than dexamethasone group. The duration of sensory and motor block was significantly prolonged in Group DM as compared to Group DS. We have observed that the mean duration of analgesia was significantly prolong in dexmedetomidine than dexamethasone group. Time for first rescue analgesic requirement was significantly prolonged in dexmedetomidine than dexamethasone group. There was no difference in adverse drug reaction between two groups.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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