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Original Research Article

Comparative evaluation of efficacy of two doses of dexmedetomidine as adjuvant to ropivacaine ultrasound guided supraclavicular brachial plexus block

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ABSTRACT

Background: Dexmedetomidine as neuraxial adjuvant decreased postoperative pain intensity, prolonged analgesic duration. But use of dexmedetomidine is associated with doses dependent increase in adverse effect like hypertension, hypotension, bradycardia, excessive sedation, sleepiness. Optimal dose of dexmedetomidine is still uncertain. Present study has been designed with an aim to evaluation of efficacy of two doses of dexmedetomidine as adjuvant to ropivacaine ultrasound guided supraclavicular brachial plexus block.
Methods: The patients were randomly divided in to two groups. Group A were received 15 ml of 0.5% ropivacaine with 50 µg one ml dexmedetomidine. Group B were received 15 ml of 0.5% of ropivacaine with 100 µg of dexmedetomidine. Parameters observed were onset of motor block, onset of sensory block, duration of sensory block, duration of motor block. Adverse drug reaction like hypertension, hypotension, bradycardia and sedation were recorded.
Results: We have observed that mean duration of analgesia was longer in group B than group A (650.54±98.54 min versus 702.22±80.24 min) but the difference is not significant statistically (p=0.08). Time for requirement of rescue analgesia was longer in group B than group A (713.45±96.21 min versus 789.23±99.23 min) but the difference is significant statistically (p=0.04).
Conclusions: From present study we can conclude that 100 µg dexmedetomidine as adjuvant to ropivacaine is no significantly better that reducing time of onset of sensory and motor block and prolongation of motor and sensory block. Duration of analgesia was comparable in both doses but time required for rescue analgesia was significantly longer higher dose group.

Keywords: Dexmedetomidine, Ropivacaine, Supraclavicular brachial plexus block

INTRODUCTION

Regional anesthesia technique has become popular in modern surgical practice because of its advantage as it lacks the complication of general anesthesia and systemic analgesics. Supraclavicular block is frequently used technique for upper limb surgery. This technique was first introduced in 1911 by Kulenkampff based on land mark based approach using novocain-adrenalin solution but because of blind approach.[1,2] With the availability of local anesthetics with better pharmacological profile and ultrasound guided technique has improved the safety of block.

The duration of block and adequate analgesia is still major limitation for success of block.[3,4] Seeking for proper adjuvant for regional block is still under research that will increase the duration of analgesia and have less adverse effect.[5] Dexmedetomidine is a selective alpha 2 receptor agonist injected intravenously to produce significant opioid sparing effects, as well as a decrease in inhalational anaesthetic requirement.[6,7] Recently various

studies have concluded that dexmedetomidine as neuraxial adjuvant decreased postoperative pain intensity, prolonged analgesic duration.[8]

But use of dexmedetomidine is associated with doses dependent increase in adverse effect like hypertension, hypotension, bradycardia, excessive sedation, sleepiness. Optimal dose of dexmedetomidine is still uncertain. Cai et al has reported that there is very low quality evidence that 30-50 μg of perineural dexmedetomidine represents an appropriate dosage, which prolongs analgesia duration by a mean period of 5 h when combined with long-acting LAs.

Perineural DEX above 60 μg can significantly increase the incidence of adverse events such as bradycardia or hypotension.[9] Some studies has reported that dexmedetomidine has been used as wide range of doses (20-150 μg) and there are no relevant published dosing guidelines or recommendations.[10,11] Based on above literature search present study has been designed with an aim to evaluation of efficacy of two doses of dexmedetomidine as adjuvant to ropivacaine ultrasound guided supraclavicular brachial plexus block

METHODS

This was a randomised, prospective comparative study conducted in the dept. of anaesthesiology Rangaraya medical science Kakinada Andhra Pradesh from December 2017 to November 2019.

Subject

Patients scheduled for upper limb surgery has been enrolled for this study as per following selection criteria.

Inclusion criteria

Age between 18 to 60 years. Both sex. ASA Class I and II

Exclusion criteria

Cardiovascular disorder. Diabetes mellitus with peripheral neuropathy. COPD. Pregnancy. Coagulation disorders.

Sample size

For calculation of sample size we have assumed that dexmedetomidine will increase the duration of analgesia by 20% based on this minimum 34 patients are require in each group. So, forty patients were enrolled in each group as per selection criteria.

Method

During our study period 80 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 A were received 15 ml of 0.5% ropivacaine with 50 microgram one ml dexmedetomidine.

Group B were received 15ml of 0.5% of ropivacaine with 100 microgram of dexmedetomidine.

Drug solution was prepared by same individual and was not part of study.

All the patient were evaluated clinically in the pre-operative period and all the basic lab investigation was done like total blood count, fasting and post prandial blood sugar, renal and liver function test, electrolytes sodium, and potassium, electrocardiogram, chest X-ray – PA view. In the operation theatre ECG (electro cardiogram), 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:- 1= normal sensation, 2= weaker in comparison to the opposite side, 3= prick recognised as blunt touch as other side 4= no sensation.[12]

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.[13]

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).14Rescue analgesia was given , once VAS was more than 4 and was provided in the form of inj tramadol 2 mg/kg intravenously.

Adverse drug reaction like hypertension, hypotension, bradycardia and sedation were recorded.

Ethics

Before start of study permission from institutional ethics committee was obtained 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 Statistical package for social sciences (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

In present study eighty patients were enrolled to evaluated the effect of two doses of dexmedetomidine as an adjuvant to ropivacaine in supraclavicular block.

As per Table 1, regarding clinicodemographic profile of the patients in two groups both groups were comparable to each other with respect to age and sex (p>0.05). The BMI was 24.68±1.99 kg/m^2 in group A and 23.89±2.01 kg/m^2. The difference in no significant statistically (p=0.32). The duration of surgery was 88.45±14.22 min in group A and 89.98±11.58 min. The difference in no significant statistically (p=0.07). Both group were comparable to each other regarding ASA score.

As per Table 2, time of onset of sensory block in group A was 10.25±2.87 min and in group A was 9.45±2.23 min.

The difference in no significant statistically (p=0.06). Time of onset of motor block in group A was 14.74±3.87min and in group A was 12.98±3.12 min. The difference in not significant statistically (p=0.25).

As per Table 3, duration of sensory block in group A was 712.25±82.44min and in group A was724.35±79.45 min. The difference in no significant statistically (p=0.54). Duration of motor block in group A was 758.55±89.47 min and in group A was 709.53±112.74 min. The difference in not significant statistically (p=0.60). We have observed that mean duration of analgesia was longer in group B than group A (650.54±98.54 min versus 702.22±80.24 min) but the difference is not significant statistically (p=0.08). time for requirement of rescue analgesia was longer in group B than group A (713.45±96.21 min versus 789.23±99.23 min) but the difference is significant statistically (p=0.04).

From table 5 it is clear that the adverse drug reaction like bradycardia, hypotension and hypertension was more common in group B than group A.

Sedation was more frequently found in patients of higher dose group.

Table 1: Clinicodemographic profile of subject under study.

Variables		Group A (N=40)	Group B (N=40)	P value
Age		38.46 ± 9.62	37.65±10.24	0.39
Sex	M	26 (65%)	22 (55 %)	0.60
	F	14 (35%)	18 (45%)	
BMI (kg/m^2)		24.68±1.99	23.89±2.01	0.32
Duration of surgery		88.45±14.22	89.98±11.58	0.07
ASA score	I	22	24	0.65
	II	18	16	

Table 2: Comparison of onset of sensory and motor block.

Parameters (min)	Group A (N=40)	Group B (N=40)	P value
Time of onset of sensory block	10.25±2.87	9.45±2.23	0.06
Time of onset of motor block	14.74±3.87	12.98±3.12	0.25

Table 3: Comparison of duration of sensory and motor block.

Parameters (min)	Group A (N=40)	Group B (N=40)	P value
Duration of sensory block	712.25±82.44	724.35±79.45	0.54
Duration of motor block	758.55±89.47	709.53±112.74	0.60

Table 4: Duration of analgesia and time for requirement of rescue analgesia in both groups.

Parameters (min)	Group A (N=40)	Group B (N=40)	P value
Mean duration of analgesia	650.54±98.54	702.22±80.24	0.08
Time for requirement of rescue analgesia	713.45±96.21	789.23±99.23	0.04

Table 5: Comparison of adverse drug reaction in two groups.

Parameters	Group A (N=40)	Group B (N=40)
Sedation	1	4
Headache	0	1
Hypotension	1	3
Bradycardia	1	4
Hypertension	1	1

DISCUSSION

In present randomised, prospective comparative study we have enrolled 80 patients and divided in two groups and group A receive 50 µg of dexmedetomidine and group B received 100 µg dexmedetomidine.

Both groups are comparable to each other with respect to age and sex. There was no difference between two group reading duration of surgery, BMI and ASA score. This finding is supported by the study of Nallam et al.[15,16]

We have observed that the time of onset of sensory and motor block was early in 100 µg dose group than low dose group but the difference is not significant statistically. Sinha et al has reported that the average time for onset and duration of sensory and motor blockade was similar in both the groups.[17] This finding supports our study. The duration of sensory and motor block was longer in 100 µg dose group than low dose group but the difference is not significant statistically. Halder et has reported that it is seen that sensory and motor block durations are also significantly greater in the group D10 ($p<0.05$) than D5 group.[18] This finding partially supports our study.

We have observed that mean duration of analgesia was longer in group B than group A (650.54±98.54 min versus 702.22±80.24 min) but the difference is not significant statistically ($p=0.08$). time for requirement of rescue analgesia was longer in group B than group A (713.45±96.21 min versus 789.23±99.23 min) but the difference is significant statistically ($p=0.04$).

Cai et al in his meta-analysis reported that in our meta-analysis, the interaction between dose of perineural DEX and mean increase in duration of analgesia was explored by grouping every 20 micrograms of DEX. Regression analysis was used to predict the relationship between them. Finally, we come to our conclusion.[9] This finding partially supports our study. Eisanach et al has reported that the analgesic action of intrathecal α2 -adrenoceptor agonists is by depressing the release of C-fibre transmitters and by hyperpolarisation of post-synaptic dorsal horn neurons.[18] This finding partially supports our study.

We have observed that the adverse drug reaction like bradycardia, hypotension and hypertension was more common in group B than group A. Sedation was more frequently found in patients of higher dose group.

Sinha et al has concluded that 1 µg/kg dexmedetomidine added perineurally to levobupivacaine in SBPB is a safer dose than 2 µg/kg with less sedation, bradycardia, and comparable analgesia.[17] This finding corroborates with our study.

CONCLUSION

From present study we can conclude that 100µg dexmedetomidine as adjuvant to ropivacaine is no significantly better that reducing time of onset of sensory and motor block and prolongation of motor and sensory block. Duration of analgesia was comparable in both doses but time required for rescue analgesia was significantly longer higher dose group. We can further conclude that higher dose is associated with more adverse effect.

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

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