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Original Research Article

A randomised prospective comparative study of evaluation of dexmedetomidine an adjuvant to ropivacaine for ultrasound guided supraclavicular block

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ABSTRACT

Background: There are clinical evidences for efficacy of dexmedetomidine as an adjuvant to local anaesthetic for peripheral nerve block, but very few published study are available on continuation of dexmedetomidine, with ropivacaine for ultrasound guided supraclavicular block. The present study has been designed to elucidate the effect of dexmedetomidine, in combination ropivacaine on various parameters.
Methods: During period of 2 year and 3 months 84 patients were enrolled for this study. Patient in Group A were received 15 ml of 0.5% ropivacaine with 100 microgram one ml dexmedetomidine and Group B were received 15ml of 0.5% of ropivacaine with 1 ml of normal saline. Drug solution was prepared by same individual and was not part of study.
Results: Both the group were comparable to each other regarding demography profile. The duration of sensory block 644.96±72.4 min in group A and the duration of sensory block in Group B was 731.53±131.54 min with p value 0.00354. The duration of motor block was 661.5±29.25 in group A and 559.77±29.25 in Group B with P value 0.0001. Duration of analgesia in Group A was 457.06±34.47 min and it was 345.70±38.032 min in Group B. The supplementation of intravenous opioid was required in 3 patients in Group A and 10 patients in group B with P value 0.037.
Conclusions: When 100 microgram of dexmedetomidine was added as an adjuvant to ropivacaine is associated with early onset of sensory and motor block, prolongation of sensory and motor block and duration of analgesia in comparison with ropivacaine alone.

Keywords: Dexmedetomidine, Ropivacaine, Ultrasound guided, Supraclavicular block

INTRODUCTION

In traditional practice regional anaesthesia was considered as art, and reproducibility of optimal result depends upon the talent of that artist anaesthesiologist. But with the use of various technologies, practice of regional anaesthesia became more rational, safer, easier and reproducible.[1]

Kulenkampff from Germany introduced supraclavicular block in clinical practice in 1911 and later it was published in 1928.[1,2] This block is used to provide regional anaesthesia for surgery of upper limb. Because of increased concern about patient safety ultra sound guided regional anaesthesia has become more popular now a day. This block is aimed to anaesthetize the three trunks of the bronchial plexus at its most effective place, and will be possible to block entire brachial plexus with a

single injection and with lowest volume of local anaesthesia.[3]

Bupivacaine is most commonly used local anaesthetic for regional block but toxicity of its dextroisomer limits its use as ideal local anaesthetic and ropivacaine has been introduced as an alternative to it. But short duration of sensory analgesia is a major limitation for the use of ropivacaine. Other invasive technique like continuous infusion or putting a perineural catheter can be, a better alternative but it increases the risk in the management of patient.[4,5] So for prolonging the duration of block various adjuvants are used along with local anaesthetics that is opioids, steroids, alpha-2 agonists etc.

Dexmedetomidine is dextro isomer of medetomidine which is specific and selective to α-2 receptor. It causes dose dependent inhibition of C- fibres and Aα-fibres. It activates membrane associated G proteins, induces chain of event to open K± channel and hyperpolarizes the neuron, so nerve fibre of pain pathway become unresponsive to signal.[6,7]

There are clinical evidences for efficacy of dexmedetomidine as an adjuvant to local anaesthetic for peripheral nerve block, but very few published study are available on continuation of dexmedetomidine, with ropivacaine for ultrasound guided supraclavicular block. The present study has been designed to elucidate the effect of dexmedetomidine, in combination Ropivacaine on the onset and duration of sensory and motor block, duration of analgesia, of ultra sound guided supraclavicular block

METHODS

This is a randomised, prospective comparative study conducted in the dept. of anaesthesiology Konaseema institute of medical science Amalapuram from August - 2015 to October 2017.

Subject

In present study patients were selected on the basis of inclusion and exclusion criteria.

Inclusion criteria

Inclusion criteria were age 16 to 60 yrs; both sex; upper limb surgery; which require supraclavi cular block; ASA class I and class II

Exclusion criteria

Exclusion criteria were cardio vascular disorder; can controlled diabetes; COPD; pregnancy; refusal of the patency; coagulopathies.

Sample size

By considering 30% increasing in duration of analgesia as clinical relevant, assuming an α- error 0.05, power of 80% and dropout rate 10% sample size was calculated to 42. For this calculation clicalc.com sample size calculator was used.[8,9]

Method

During period of 2 year and 3 months 84 patients 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. Patient in Group A were received 15 ml of 0.5% ropivacaine with 100 microgram one ml dexmedetomidine and Group B were received 15ml of 0.5% of ropivacaine with 1 ml of normal saline. 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 leucocyte count, differential count, platelets, renal and liver function test, electrolytes sodium, and potassium, electrocardiogram, chest x-ray –PA view. Once patient was inside 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. Fluids were administrated based on the Holliday – Segar rule.[10]

Under all aseptic condition supraclavicular block was performed under ultrasound guided technique using Sonosite m turbo with liner probe. After placing the block, the patient's heart rate, and oxygen saturation was continuously monitored while 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.[11]

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.[12]

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).[13] Rescue analgesia was given, once VAS was more than 4 and was provided in the form of inj 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 calculations

The result were tabulated into excel seat and data was analysed using SPPS version 16 software. Results were expressed as mean and the groups were compared using the using unpaired t test and chi square test.

RESULTS

The mean age in group A was 35.25±10.64 yrs and in group B it was 35.94±12.45 yrs. There was no statistical difference between two groups. Both the groups were comparable in terms of age distribution (p=0.413984).

Male and female distribution was 32/10 in group A and 31/11 in group B this was not significant statistically (p=0.0635). The mean weight in Group A was 67.25±13.15 kg and group B it was 64.48±11.73 kg. P value was 0.1967; hence there is no significant difference statically. Regarding type of surgery, in group A surgery on soft tissue was 24 and bone was 18, similarly in group B surgery on bone was 22 and soft tissue was 20. Both groups were comparable with regard to type of surgery performed.

Table 1: Demography of patients.

Variables		Group A (mean±SD)	Group B (mean±SD)	P value
Age (yrs)		35.25±10.64	35.90±12.45	0. 413984
Sex	M	32	31	Chi square statistic= 0.0635; 0.19607
	F	10	11	
Weight (kg)		67.25±13.15	64.4838±11.73	0.801059
Type of surgery	Soft tissue	24	22	0.661076; Chi square statistic= 0.1922
	Bone	18	20	
Duration of surgery (min)		105.48±14.08	103.5±11.31	0.301558
ASA	Grade-I	32	28	Chi square static= 0.9333; p=0.33399
	Grade-II	10	14	

Table 2: Comparison of block characteristic in two groups.

Variables	Group A Mean±SD	Group B Mean±SD	P value
Onset of sensory block (min)	13.9± 3.18	15.8±3.29	0.01347
Onset of motor block (min)	18.67±3.06	19.46±3.75	0.016556
Duration of sensory block (min)	721.53±131.54	644.96±72.4	0.003547
Duration of motor block (min)	661.54±49.85	559.77±29.25	0.0001
Duration of analgesia (min)	457.06±34.47	345.70±38.032	0.00001
Intravenous opioid supplementation	Yes 3	10	Chi square statistic= 4.4594; p value 0.037
	No 39	32	

The mean duration of surgery in Group A was 105.48±11.08 this and group B it was 103.5±11.31 min which was comparable to each other with p>0.05.

The ASA score was grade –I in 32 patients and grade-II in 10 patients in group A. In group B 28 patients ASA score was grade-I and 14 patients ASA scare was grade II.

As per Table 2 mean time required for onset of sensory block was 13.9±3.18 min in group A. Similar in Group B the mean time required for the onset of sensory block was 15.8±3.99 min, with P value 0.013 Time required for onset of motor block in group A was 18.46±3.25min and in group B it was19.46±3.75 with P value 0.0165656.

The duration of sensory block 731.53±131.54 min in group A and the duration of sensory block in Group B was 644.96±72.4 min with p value 0.00354.

The duration of motor block was 661.5±29.25 in group A and 559.77±29.25 in Group B with P value 0.0001. Duration of analgesia in Group A was 457.06±34.47 min and it was 345.70±38.032 min in Group B.

The supplementation of intravenous opioid was required in 3 patients in Group A and 10 patients in group B with p=0.037.

DISCUSSION

To achieve an ideal regional block various adjuvants are added to local anaesthetics. We started our study to elucidate the effect of dexmedetomidine as an adjuvant to ropivacaine in ultrasound guided supraclavicular block.

Total 84 patients were enrolled and divided into two groups. Patient enrolled in both group were matched with each other with regard to age, sex, weight, type of sensory, duration of sensory and ASA scare, with p>0.05 in all the Groups, so difference between the two group were not significant statically.

Onset of sensory block was significantly earlier in group A then Group B with p=0.01347. This finding correlates with the finding of Katsanevaki et al, which is significantly earlier than our study. Our finding also corroborates with the study of Das et al.[14,15]

Onset of motor block was significantly early in Dexmedetomidine and ropivacaine group than Group B this finding is also supported by the work of various author. This finding is similar to the finding of morhofel et al and Katsanevaki et al.[14,16.]

Duration of sensory block was significantly high in group A then in group B (721.53±131.54 min vs 644.96±72.41 min) this finding corroborates with the finding of Indira Gugrajala et al and Das et al.[15,17]

Motor block duration was also significantly increased in group in group A then group B with P value 0.0001. (661.54±49.85 vs 559.77±29.25). This finding is also similar to the work of Zhang, wrong et al and swami et al.[18,19]

In present study we have found that the duration of analgesia was increased significantly that is 457.06±34.47 min vs 345.70±38.032 min with P value 0.0001. Dexmedetomidine acts on α2 receptor and inhibit the firing of nociceptive neurons stimulated by peripheral Aα and C fibres, it also inhibits the release of the nociceptive neurotransmitter substance P. This is responsible for its potentiation of analgesic effect of local anaesthetics. This finding corroborates with the work of Zhang et al and Andersen et al.[18,20]

Regarding requirement of opioid supplementation in group A four patient require intravenous opioid and seven patient requires intravenous supplementation in group B which was not significant statistically with p value 0.3319. But more patient in group B required analgesic supplementation this finding corroborates with the finding of Kathuria et al.[21]

CONCLUSION

When 100 microgram of dexmedetomidine was added as an adjuvant to ropivacaine is associated with early onset of sensory and motor block, prolongation of sensory and motor block and duration of analgesia in comparison with ropivacaine alone. It is also associated with decreased requirement of rescue analgesia in dexmedetomidine group.

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