Original Research Paper

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A RANDOMISED CONTROLLED COMPARATIVE DOUBLE BLINDED STIDY OF TWO DIFFERENT DOSES OF AN DEXMEDETOMIDINE AS ADJUVANT TO BUPIVACAINE IN SUPRA CLAVICULAR BRACHIAL PLEXUS BLOCK FOR UPPER LIMB ORTHOPAEDIC SURGERIES

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ABSTRACT To compare the two different doses of dexmedetomidine for optimal dose of dexmedetomidine as adjuvant to bupivacaine in supra clavicular brachial plexus block for upper limb orthopedic surgeries. We studied 60 ASA l & ll patients undergoing upper limb orthopaedic surgeries including fracture radius and ulna and hand under supra clavicular brachial plexus block. Patients were randomly allocated to two groups. Group A :(n-30) – 30 ml 0.25% bupivacaine + dexmedetomidine 50mcg.Group B :(n-30) – 30ml 0.25% bupivacaine + dexmedetomidine 75mcg. Patients were evaluated for sensory & motor block onset and duration, duration of analgesia, hemodynamic parameters.Sensory block onset was longer in group A (16.3±3.31) than group B(12.4±2.5) and motor block onset also longer in group A (20.4±2.7) than group B (16.15±2.89). The mean duration of analgesia was dose dependent B (642±76.5) > A(480.5±81.3)minutes.We conclude that dexmedetomidine 75µg is an optimal dose to provide prolonged post-operative analgesia without significant side effect.

KEYWORDS : Dexmedetomidine , Bupivacaine , supraclavicular brachial plexus

INTRODUCTION:

Peripheral nerve blocks, in orthopaedic surgical procedures, have the advantage of good intra and post- operative analgesia and improved patient comfort. Even though supraclavicular brachial plexus block provides fast, complete and dense analgesia for upper limb procedures[1] The effect tends to wear off rapidly due to high vascularity of the site. To overcome this, several adjuvants are used among which dexmedetomidine has achieved considerable popularity recently.

Although there are several studies showing the efficacy of dexmedetomidine as an adjuvant, there is no clear consensus regarding an ideal dose to be used. In this study, we are trying to find out an optimum dose of dexmedetomidine which provides maximum improvement in block characteristics with minimum untoward effect

MATERIALS AND METHODS: This study was carried out in the orthopaedic surgery theatre, NRI medical college and hospital after obtaining institutional ethical committee approval.

- To compare the effect of two different doses of dexmedetomidine as adjuvant to bupivacaine in supra clavicular brachial plexus block in terms of
- Onset and duration of sensory block
- Onset and duration of motor block
- Duration of analgesia
- Adverse effects like hypotension, bradycardia, sedation

STUDY DESIGN

- This is a randomized, prospective, double blinded study.
- The study has started after receiving Institutional Ethical Committee approval and informed written consent from all the patients. .

RANDOMISATION

- Simple randomized sampling was done by computer generated random number.

SAMPLE SIZE : 60

Patients were randomly allocated to two groups.

- Group A :(n-30) – 30 ml 0.25% bupivacaine + dexmedetomidine 50mcg.
- Group B :(n-30) – 30ml 0.25% bupivacaine + dexmedetomidine 75mcg

INCLUSION CRITERIA

- Age – 20-60 years
- Weight – 50-80 kg
- ASA I & II
- Written informed consent
- Upper limb orthopedic surgeries

EXCLUSION CRITERIA

- Significant neurological disease
- Pregnancy and lactation
- Patients on anticoagulation
- Significant systemic disorder
- Known hypersensitivity to study drugs

MATERIAL

- Sterile tray for regional block
- Drugs for the block
- Peripheral nerve stimulator & drugs for resuscitation

PREPARATION OF STUDY

- Bupivacaine is prepared as 30ml of 0.25% solution by adding 15ml distilled water to15ML of 0.5% bupivacaine.
- Dexmedetomidine is prepared by taking the drug in insulin syringe .40 units syringe equal to1ml - 40 units equalto 100µg, 30 units equal to 75µg, and 20 units equal to 50µg
- The drug solutions were prepared by an anaesthesiologist blinded to the study groups and not involved in the study
- After securing a patent intravenous cannula with 20G on the non-operating hand, baseline heart rate(HR), non-invasive blood pressure (systolic(SBP) and diastolic(DBP)) and oxygen saturation were recorded(SpO2).
- ECG and SpO2 were monitored continuously and blood pressure was monitored every five minutes.
- Supraclavicular brachial plexus block was performed by subclavian perivascular approach using peripheral nerve stimulator (Stimuplex, B/Braun, Germany) with 22G, 5cm needle.
- The end point was a motor response of fingers with a current of 0.4mA
- Group A received 30ml of 0.25% bupivacaine and dexmedetomidine 50mcg
- Group B received 30ml 0f 0.25% bupivacaine and dexmedetomidine 75mcg
- Both sensory and motor block were assessed every 3 minutes till their onset and every 30 minutes after the completion of the procedure till the blocks were wear off.
- Intraoperatively HR, SBP, DBP and SpO2were recorded at 0 minute (immediately after drug administration) and then 5, 10, 15, 30, 45, 60, 90, 120 & 150 minutes from the time of drug administration.
- Sedation was assessed and recorded according to modified Ramsay sedation scale.

Modified Ramsay sedation scale

1. Patient is anxious and agitated or restless or both
2. Patient is co-operative, oriented and tranquil
3 Patient responds to commands only
4. Patient exhibits brisk response to light glabellar tap or loud auditory stimulus

5. Patient exhibits a sluggish response to light glabellar tap or loud auditory stimulus
6. Patient exhibits no response.

Sensory block was assessed by pinprick on all four nerve territories i.e., ulnar, radial, median and musculocutaneous, using a 3 point scale

- 0- normal sensation
- 1- loss of pin prick sensation
- 2- loss of touch sensation.

Motor block was assessed by thumb abduction (radial nerve), adduction (ulnar nerve), opposition (median nerve) and flexion of elbow (musculocutaneous nerve) according to modified Bromage scale.

- Grade 0 – Normal motor function with full movement of elbow, wrist and fingers.
- Grade 1 – Decreased motor strength with ability to move fingers only.
- Grade 2 - Complete motor block with inability to move fingers.
- Duration of analgesia was defined as the interval between the onset of complete sensory block and the time at which subjective sensation of pain was first felt.

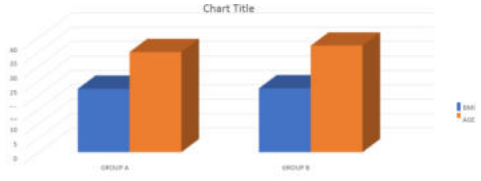
VAS Score
- 0 – No pain
- 3 – Mild pain
- 5 – Moderate pain
- 10 – Most severe pain

- Inj. Diclofenac 75mg intramuscularly is given as a rescue analgesic when the pain score is more than 4
- Hypotension was managed with injection mephentermine 6mg IV.
- Bradycardia was managed with injection atropine 0.6mg IV.
- Onset and duration of sensory and motor block were studied as primary outcome and duration of analgesia and sedation scores and hemodynamic parameters were studied as secondary outcome.
- Data was compiled and analyzed using Statistical Package for Social Sciences version (SPSS) 20.
- Independent T test was used to test the significance of difference between quantitative variables

RESULTS

- Group A: Dexmedetomidine 50 mcg
- Group B: Dexmedetomidine 75 mcg
- Both groups were matched according to their age and BMI for randomization and found that there was no statistical difference between the mean ages and BMI between them.

MEAN AGE & BMI



ONSET OF SENSORY BLOCK

Parameter	Sensory Block onset (minutes)	
	Group A	Group B
Mean	15.73	12.6
S.D	3.413	2.581
T value	4.010	4.010
'P' value	< 0.0001 Significant	

ONSET OF MOTOR BLOCK

Parameter	Motor Block onset (minutes)	
	Group A	Group B
Mean	19.93	16.43
S.D	3.016	2.932
T test	4.557	4.557
P value	< 0.0001 Significant	

DURATION OF SENSORY BLOCK

Parameter	sensory Block Duration (minutes)	
	Group A	Group B
Mean	436.67	634.67
S.D	67.739	69.715
T test.	-11.157	-11.157
P value	< 0.0001 Significant	

DURATION OF MOTOR BLOCK

Parameter	Motor Block Duration (minutes)	
	Group A	Group B
Mean	426.00	612.00
S.D	78.151	89.574
T test	-8.570	-8.570
P value	< 0.0001 Significant	

DURATION OF ANALGESIA

Parameter	Duration of Analgesia (minutes)	
	Group A	Group B
Mean	491.33	647.67
S.D	77.359	74.865
T test	-7.954	-7.954
P value	< 0.0001 Significant	

- In Group B there was a statistically significant shortening of onset time and prolongation of duration of both sensory and motor block compared to Group A
- Duration of analgesia was also prolonged in Group B than Group A
- None of the patients in any group developed hypotension, bradycardia and hypoxia.

DISCUSSION

- Dexmedetomidine is an α2-adrenoreceptor agonist with excellent analgesic properties and wide margin of safety.
- It has α2/α1 binding selectivity ratio of 1620:1 as compared to 220:1 for clonidine.
- This high selectivity for α2 receptors makes it more effective as a sedative and analgesic agent while minimising the unwanted effect of α1 receptor stimulation.
- Agarwal et al compared equal doses (1mcg/kg) of clonidine and dexmedetomidine in peripheral nerve block and concluded that that dexmedetomidine is more efficient than clonidine in improving block characteristics
- The mechanism by which dexmedetomidine affects the nerve block is multi-factorial
- Peripherally, it acts by inhibiting the release of nor-epinephrine and also by direct effect on nerve action potential.
- Centrally, it acts by activation of α2-adrenoreceptors of locus coeruleus and by inhibiting the release of substance P3
- Brummet et al;demonstrated dose dependent increase in sensory and motor blockade duration in rat sciatic nerve with dexmedetomidine as adjuvant to bupivacaine and found that even a very high dose of 40mcg/kg did not cause any neurotoxicity)4
- In a study by Gandhi et al, a dose of 30mcg dexmedetomidine added to bupivacaine in supraclavicular block was found to delay the onset of sensory and motor blockade. The duration of sensory and motor blockade and duration of analgesia was found to be prolonged without any significant change in vital parameters)5
- Marhofer et al used a smaller dose of 20mcg dexmedetomidine along with ropivacaine for ulnar nerve block in healthy volunteers and observed a faster onset of sensory block and prolonged duration of both sensory and motor block. No significant change in onset of motor block or vital parameters was noted.
- Almarakabi et al studied the effects of 0.5mcg/kg of dexmedetomidine along with bupivacaine in transversus abdominis plane block and concluded that perineural dexmedetomidine, in this dose, provided better pain control

without any side-effects. There was no change in bi-spectral index (BIS) values as compared to control group which suggested absence of change in sedation state with a dose of 0.5mcg/kg of perineural dexmedetomidine)

CONCLUSION

In this double blinded comparative study, we compared the clinical profile of varying doses of dexmedetomidine as adjuvant to bupivacaine in supraclavicular brachial plexus block. We found that the dose of 50 mcg of dexmedetomidine showed significant improvement only in duration of analgesia. 75 mcg dose made the onset faster and prolonged the duration of block and analgesia. Thus we conclude that dexmedetomodine when used in a dose of 75mcg or approximately 1mcg/kg, as adjuvant in peripheral nerve block, has the advantages of conscious sedation, hemodynamic stability and minimal motor blockade in addition to significant improvement in block characteristics.

REFERENCES

1. Hanumanthaiah D, Vaidyanathan S, Garstka M, Szucs S, Iohom G. Ultrasound guided supraclavicular block. Med Ultrason 2013;15:224-9.
2. Agarwal S, Aggarwal R, Gupta P. Dexmedetomidine prolongs the effect of bupivacaine in supraclavicular brachial plexus block. J Anaesthesiol Clin Pharmacol2014;30:36-40.
3. Marhofer D, Kettner SC, Marhofer P, Pils S, Weber M, Zeitlinger M. Dexmedetomidine as an adjuvant to ropivacaine prolongs peripheral nerve block: a volunteer study. Br J Anaesth 2013;110:438-42.
4. Brummett CM, Norat MA, Palmisano JM, Lydic R. Perineural administration of dexmedetomidine in combination with bupivacaine enhances sensory and motor blockade in sciatic nerve block without inducing neurotoxicity in rat. Anesthesiology 2008;109:502-11.
5. Gandhi R, Shah A, Patel I. Use of dexmedetomidine along with bupivacaine for brachial plexus block. Natl J Med Res 2012;2:67-9.
6. Almarakbi WA, Kaki AM. Addition of dexmedetomidine to bupivacaine in transversus abdominis plane block potentiates post-operative pain relief among abdominal hysterectomy patients: A prospective randomized controlled trial. Saudi J Anaesth 2014;8:161-6.