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A RANDOMIZED PLACEBO CONTROL DOUBLE BLINDED COMPARISON OF EFFECT OF INTRAVENOUS DEXMEDETOMIDINE ON DURATION AND INTENSITY OF BRACHIAL PLEXUS BLOCK

Anaesthesiology

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ABSTRACT

BACKGROUND: Brachial plexus block (BPB) for upper extremity surgery provides superior analgesia, but this advantage is limited by the pharmacological duration of local anesthetics. We did this study to assess the effect of intravenous infusion of dexmedetomidine on duration and intensity of Brachial plexus block. **METHODS:** 30 patients were enrolled for the prospective randomized double blinded controlled trial study. Sensory block duration, motor block duration, onset time of sensory and motor block, time to first analgesic request, the common adverse effects were analyzed using a computer-generated randomization table. **RESULTS:** 30 patients were included receiving DEX. The addition of DEX prolonged the duration of sensory block, motor block and analgesia **CONCLUSIONS:**dexmeditomidine in the dose of 0.5µg/kg/min augments the effect of Brachial Plexus Block without causing significant changes in haemodynamic parameters.

KEYWORDS

INTRODUCTION:

The technique of peripheral neural blockade was developed in the early 1980's by Halstead and Hall who used cocaine to create peripheral nerve blocks at different sites including the ulnar, supratrochlear, infraorbital and musculocutaneous nerves. James Leonard Corning also contributed to regional anaesthesia by using Esmarch bandage in 1885 which helped to arrest the local circulation leading to prolonged duration of block and decrease uptake of local anaesthetic from tissue.[1] Peripheral nerve block is an essential component of comprehensive anaesthetic care. Brachial plexus block is a type of regional anaesthesia used in surgeries of upper limb. It's advantages are that it can be used in day care setting, high risk patients and hemodynamically unstable patients. At times there may be sparing of some nerves so that the patient may have touch or the pain sensation inspite of apparently good block. It is seen that intravenous Dexmedetomidine decreases the inhalational anaesthesia and opioid requirement during general anaesthesia. It produces sedation and anxiolysis by binding to alpha 2 receptors in the locus ceruleus which determines the release of norepinephrine and inhibits sympathetic activity. It prolongs the duration of sensory and motor blockade by supraspinal, direct analgesic and/or vaso-constrictive action.[2] There have been many studies done in the past which shows that intravenous Dexmedetomidine prolongs the sensory and motor blockade of bupivacaine in brachial plexus block.[3] The present study is designed to study the effects of intravenous infusion of Dexmedetomidine in a dose of 0.5µg/kg/hr on brachial plexus block with respect to duration of sensory and motor blockade.

MATERIALS & METHODS

This study was done in Department of Anaesthesiology, at a tertiary care hospital. This study was initiated only after approval by Institutional Ethics Committee and Maharashtra University of Health Sciences (MUHS). Patients who fulfilled the inclusion criteria (Patients who gave consent to participate in the study wilfully, ll patients undergoing surgeries of forearm, wrist and hand with American Society of Anaesthesiology physical status classification designated I, II.,Age >18 years and <65 years) were enrolled in the study after obtaining informed consent. A complete pre-anaesthetic assessment of all the patients was done besides the general and systemic examination along with required routine investigations. 30 patients were enrolled for the study. Sample size was calculated by nmaster1.0 and keeping duration of analgesia as end point in calculation, keeping S.D in group S (normal saline) as 55 min and Dexmedetomidine group as 57 min to find a difference of 59 minutes between two groups setting alpha error as 5% and power of study as 80% 15 patient were needed per group hence a total sample size of 30 was selected. It was a prospective randomized double blinded controlled trial. Using a computer-generated randomization table, the patients were randomly divided into two groups of 15 each.

Group D – Patients included in this group were given intravenous infusion of Dexmedetomidine in a dose of 0.5µg/kg/hr after the onset of block.

Group S – Patients included in this group were given intravenous infusion of normal saline after the onset of block.

Dexmedetomidine was prepared in a 50 cc syringe using 1ampoule (2ml) dexmedetomidine containing 100µg/ml diluted with normal saline. 20ml Bupivacaine 0.5% was drawn in a 20ml syringe. 10ml Lignocaine 2% was drawn in 10ml syringe. All patients were prehydrated with 500ml of Ringer's lactate solution via an 18-gauge intavenous cannula inserted in the dorsum of the opposite hand which is not to be operated upon. An 18-gauge intravenous cannula was inserted in the nondominant forearm after applying standard monitoring equipment. Preoperative vital parameters in the form of heart rate, systolic blood pressure, diastolic blood pressure, respiratory rate and oxygen saturation were recorded. Oxygen at 6L/min with Hudson's mask was supplemented. Intravenous premedication with injection midazolam(0.03mg/kg) and injection fentanyl citrate (2µg/kg) was given in a bolus dose to all patients to allay anxiety and apprehension. Patient was positioned supine with arm by the side of patient. Under all aseptic precautions, Brachial plexus block was given to all patients using the local anaesthetic agents 20ml 0.5%bupivacaine and 10ml 2%lignocaine (total 30 ml) drawn up in different syringes by subclavian peri-vascular technique. Subclavian perivascular block was given using plumb-bob approach with a peripheral nerve stimulator using the lowest possible current (<0.5mA) and stimuplex needle. After LA injection through the needle, measurement of sensory and motor blockade was carried out every 5mins till 20mins by a blinded assesser. Toxicity of local anaesthetic like perioral numbness, dizziness or convulsions was looked for during this period. Sensory blockade of the musculocutaneous, median, radial and ulnar nerves was assessed on lateral aspect of forearm, volar aspect of thumb, lateral aspect of dorsum of hand and volar aspect of fifth finger respectively. Motor blockade of the musculocutaneous, radial, median and ulnar nerves was evaluated by elbow flexion, thumb abduction, thumb opposition and thumb adduction respectively. Overall, the maximum composite score was 16. The patient was considered ready for surgery when minimal score of 14 was achieved. If after 20mins, composite score was less than 14 then the patient was given general anaesthesia and excluded from study. Once a minimum composite score of ≥14 was achieved block was achieved intravenous infusion of dexmedetomidine was started at the rate of 5-7ml/hr in patients assigned to Group D and infusion of 0.9% saline at the rate of 5-7ml/hr was started in patients allocated to Group S and was continued till the end of surgery. Both the patient and the anesthesiologist were blinded to the treatment group and all recordings were performed by an anesthesiologist blinded to group allocation. Sensory and motor block were assessed every 10min for the first 120min and thereafter every

20min during surgery and postoperatively. Pain in post-operative period was assessed by using Visual analogue scale. When the patient's VAS score was ≥4, rescue analgesia in the form of intravenous paracetamol(15mg/kg) was given. The time at which first rescue analgesia was given after brachial plexus block was recorded and taken as end point of the study .

OBSERVATIONS AND RESULT

A total of 30 patients undergoing upper limb surgery with ASA grade I/II were included in the study and were randomly allocated to two groups by computer generated random numbers.

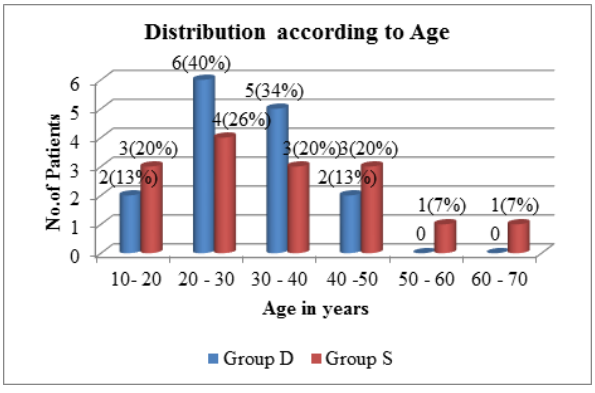

Fig.no.1: Distribution according to age

Most of the patients(33%) in the study belonged to 20-30 years age group.

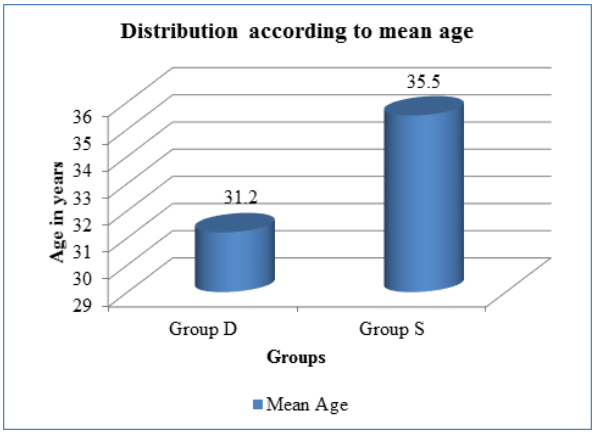

Fig.no.2: Mean Age Distribution

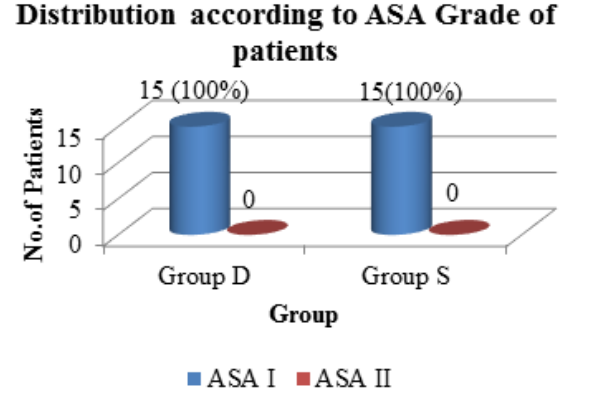

Fig 3: Distribution according to ASA Grade

All the patients in the study belonged to ASA grade I.

Table no.1: Distribution according to Total Composite Score after Brachial plexus block

Total Composite Score	Group D	Group S	Total
14	4(27%)	4(27%)	8(27%)
15	3(20%)	4(27%)	7(33%)
16	8(53%)	7(46%)	15(50%)
Total	15	15	30

Effectiveness of brachial plexus block was estimated on the basis of total composite score at the end of 20minutes by using 3 point scale in sensory and motor block. The patient was considered ready for surgery when minimal score of 14 was achieved. Maximum patients (50%) achieved a total composite score of 16 suggestive of good block in both the group.

Table no.2: Distribution according to duration of Sensory block

	No. Of Patients	Mean Duration (minutes)	Std. Deviation	Std. Error Mean
Group D	15	363.1	31.36	8.09
Group S	15	188.5	46.69	12.05

Applying t-test of Equality of Means, p = 0.00

Table no.3: Distribution according to Mean Duration of Motor block

	No. Of Patients	Mean duration (Minutes)	Std. Deviation	Std. Error Mean
Group D	15	385.40	37.94	9.79
Group S	15	273.00	36.02	9.30

Applying t-test for equality of means, p = 0.00

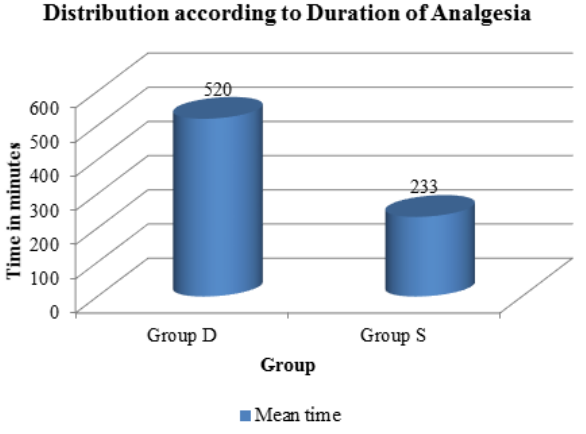

Fig.no.4: Distribution according to Duration of Analgesia

DISCUSSION

Need for safe and effective anaesthetic technique has always posed a challenge to anaesthesiologist. However, regional anaesthesia scores over general anaesthesia, with respect to lesser opioid based side effects, lower pain scores, longer time to first analgesic request, increased patient satisfaction score, less time spent in post anaesthesia care unit, earlier discharge.[4] But inspite of this, problems like anxiety, inadequate sedation, patchy block, increased sympathetic activity remain to be answered. Barbiturates and opioids when given intravenously after regional anaesthesia alleviated most of the above needs but at the cost of hemodynamic instability and respiratory depression. With the advent of α2 agonist drugs, anaesthesiologist found a drug which would provide better conditions to surgeon and patients by causing moderate sedation without hemodynamic and respiratory instability.[6] Dexmedetomidine is approved for both intensive care sedation for 24hours duration and for intra-operative use due to its surprisingly effective analgesic and sedative properties. Analgesic action of dexmedetomidine is mediated by spinal as well as supraspinal pathways. It inhibits nociceptive signal propagation in spinal cord by its direct action as well as by inhibition of locus ceruleus. It also inhibits pain propagation in peripheral nerves.[7] This acts complementary to local anaesthetics and prolongs the effective duration of block and reduces the need for additional opioid analgesia. This study was primarily aimed to study effectiveness of intravenous dexmedetomidine on brachial plexus block.

CONCLUSION

Dexmedetomidine, a highly selective α2 agonist, in the dose of 0.5µg/kg/hr, can be used as an intravenous infusion after giving brachial plexus block in upper limb surgery to increase the duration of analgesia. Dexmedetomidine causes significant prolongation of sensory and motor blockade. Thus dexmeditomidine in the dose of 0.5µg/kg/min augments the effect of Brachial Plexus Block without

causing significant changes in haemodynamic parameters.

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