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Original Research Article

COMPARISON OF DEXAMETHASONE AND DEXMEDETOMIDINE AS AN ADJUVANT TO 0.5% ROPIVACAINE IN ULTRASOUND GUIDED SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK IN PATIENTS UNDERGOING OPEN REDUCTION AND INTERNAL FIXATION FOR FRACTURE BOTH BONES FOREARM

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ABSTRACT

Background: Adjuvants are added to local anaesthetics to increase the duration of block and provide better analgesia. The present study was aimed at comparing dexmedetomidine and dexamethasone as adjuvants to ropivacaine in ultrasound (USG) guided supraclavicular brachial plexus block (SCBPB) in patients undergoing surgery for fracture bone bones (BB)forearm.

Materials and Methods: 80 adult patients of age group 18-60 years, belonging to American society of anesthesiologists (ASA) grade I & II undergoing surgery for fracture BB forearm under USG guided supraclavicular block were included in the study. In Group A (n=40), USG guided SCBPB was administered with 24 ml of 0.5% ropivacaine containing 1 mcg/kg dexmedetomidine and in Group B USG guided SCBPB was administered with 24 ml of 0.5% ropivacaine containing 8 mg dexamethasone. The onset and duration of sensory and motor block, VAS score and duration of analgesia was compared in both the groups.

Results: The onset of motor and sensory block was comparable in both the groups. The duration of sensory block, motor block and duration of analgesia was significantly prolonged in group A in comparison to group B ($p < 0.0001$, $p < 0.0001$, $p < 0.0001$ respectively). VAS score was significantly lower in group A at 16 hrs ($p < 0.0001$) and the need for rescue analgesia was lower in group A ($p = 0.0289$).

Conclusion: 1mcg/kg dexmedetomidine is superior to 8 mg dexamethasone as an adjuvant to ropivacaine in USG guided supraclavicular brachial plexus block as it provides longer duration of sensory block, motor block and duration of analgesia.

Keywords: Dexmedetomidine, dexamethasone, sensory block, motor block, analgesia.

INTRODUCTION

Fracture of both bones fore arm is associated with significant postoperative pain and if not addressed properly can lead to patient dissatisfaction. Open reduction and internal fixation (ORIF) for fracture of both bones fore arm is routinely done under supraclavicular brachial plexus block. Utilization of

ultrasonography (USG) improves the success rate and minimizes complications. However, the duration of analgesia is limited by the duration of action of local anaesthetic. Hence, adjuvants such as midazolam, neostigmine, fentanyl, clonidine and dexamethasone are used as adjuvants for prolongation of duration of analgesia. Benzodiazepines and opioids are associated with respiratory depression, alpha 2 agonists are associated with bradycardia and hypotension and steroids may cause hyperglycemia and delayed wound healing. Till today, the ideal adjuvant with significantly prolonged duration of analgesia which is devoid of complications remains unknown.

Dexmedetomidine is a newer alpha 2 agonists with 8 times more selectivity than clonidine for alpha 2 receptors and produces sedoanalgesia without respiratory depression. Dexamethasone is widely used as an adjuvant in regional blocks. A recent study has found that single dexamethasone in regional block can be used safely in patients with controlled diabetes. Absence of side effects even in diabetics has renewed its interest as adjuvant in regional blocks. We hypothesized that both dexamethasone and dexmedetomidine are equally efficacious in prolonging duration of analgesia in patients undergoing ORIF for fracture BB forearm under USG guided supraclavicular brachial plexus block. The primary objective was to compare the duration of analgesia and secondary objectives included onset and duration of sensory and motor block and complications if any.

MATERIALS AND METHODS

The present study was carried out in a tertiary care teaching hospital after obtaining approval of institutional ethical committee. 80 adult patients of age group 18-60 years, belonging to American society of anesthesiologists (ASA) grade I & II undergoing ORIF for fracture BB forearm under USG guided supraclavicular block were included in the study. Patients with history of allergy to study drugs, cardiorespiratory diseases, pregnant patients, and patients having coagulopathy and neurologic deficits were excluded from the study.

Patients were randomized into two groups with 40 patients in each group

Group A: USG guided SCBPB was administered with 24 ml of 0.5% ropivacaine containing 1 mcg/kg dexmedetomidine

Group B: USG guided SCBPB was administered with 24 ml of 0.5% ropivacaine containing 8 mg dexamethasone

Randomization and blinding: After checking for eligibility, patients were enrolled and randomized into two groups using computer generated random numbers and blinding was done using opaque sealed envelopes. Neither the patient nor the anaesthesiologist administering the block and monitoring the patient postoperatively were aware of group allocation.

All patients underwent pre-anaesthetic evaluation (PAE), the procedure of block and visual analogue scale (VAS) score was explained to them. Written informed consent was obtained from all the patients and the patients were kept nil orally for 8 hours before surgery. On the day of surgery, patients were shifted to operation theatre and standard monitors such as pulse oximeter, non-invasive blood pressure (NIBP) and electrocardiogram (ECG) were connected. 20 G intravenous cannula was secured in contralateral limb and maintenance IV fluids were started. Under all aseptic and antiseptic precautions, ultrasound scan was performed using Sonosite SII machine and high frequency linear probe (13-6 Mhz) with patient in supine position, arm adducted and head turned towards opposite side. The USG transducer was placed in coronal oblique plane in supraclavicular region and brachial plexus were identified as a bunch of hypoechoeic structures lateral to the subclavian artery. Needle was inserted in an in-plane approach from lateral to medial direction. The study drug was injected in 3 aliquots of 8 ml each at the upper part, middle part and corner pocket of brachial plexus.

Onset of sensory and motor block was assessed every 3 min till complete block or 30 min whichever was earlier. Sensory block was assessed in the distribution of 5 nerves, medial cutaneous nerve of forearm (medial forearm), musculocutaneous nerve (lateral forearm), median nerve (palmar aspect of second finger), ulnar nerve (fifth finger) and radial nerve (dorsum of the hand between thumb and second finger). A 3-point scale was used for assessing sensory block using an alcohol swab as follows: 0 – no sensory block (cold sensation felt), 1 – analgesia (cold sensation not felt but touch felt), 2 – complete anaesthesia (even touch sensation was not felt). Satisfactory sensory block was considered when a minimum score of 9/10 was achieved. Motor block was assessed by testing elbow flexion (musculocutaneous nerve), opposition of thumb (median nerve), adduction of thumb (ulnar nerve) and abduction of thumb (radial nerve) on a 3-point scale as follows: 0 – no motor block, 1 – paresis (decreased motor power) and 2 – paralysis (complete loss of power). Sensory and motor block onset time was measured from the time of completion of administration of the study drug. Sensory block score less than 9/10 was considered as block failure and the patient was excluded from the study. Intraoperative haemodynamic parameters were recorded at 10 minutes interval till completion of surgery and hourly till 4 hours postoperatively. Patients were monitored postoperatively for sensory and motor regression every 20 min till complete recovery of sensory and motor function. Duration of sensory block was taken as the time interval between onset of sensory block and complete resolution of sensory block (score 0). Duration of motor block was taken as the time interval between

onset of motor block and complete resolution of motor block (score 0). Postoperative pain was assessed using VAS score on a scale of 0 (no pain) to 10 (worst imaginable pain). Inj. Tramadol 1.5 mg/kg IV (preceded by inj. Ondansetron 4 mg IV) was administered as rescue analgesia when VAS score was 4 and above. Duration of analgesia was taken as the time interval between the onset of sensory block and time for first rescue analgesia. Number of doses of rescue analgesia required in 24 hours was noted. Intraoperative sedation was assessed using modified Ramsay sedation score and any complications were noted.

Statistical Analysis

Based on the results of pilot study; to detect a 25% difference in the duration of analgesia with 95% confidence interval and 80% power of study, we needed 28 patients in each group. to compensate for loss to follow up and failed block, we included 40 patients in each group. quantitative data was expressed as mean and SD and analyzed using student's t test, and qualitative data was expressed as percent or fraction and analyzed using chi square test. P value less than 0.05 was considered as statistically significant. Data was analyzed using MedCalc - version 23.0.9 software, Belgium.

RESULTS

Demographic data and duration of surgery was comparable in both the groups. [Table 1]

Table 1: Demographic data and duration of surgery

	Group A (n = 40)	Group B (n = 40)	P value
Age (in years)	36.5±7.9	37.2±7.2	0.6799
Sex (M/F)	22/18	23/17	0.8216
Body mass index (BMI)	23.9±2.8	24.5±3.6	0.4079
Duration of surgery (in minutes)	98.6±12.6	99.8±11.8	0.6614

Table 2: Block characteristics

Block characteristics	Group A (Ropivacaine + Dexmedetomidine) Mean±SD	Group B (Ropivacaine +Dexamethasone) Mean±SD	P value
Onset of sensory block (in mins)	12.8±3.6	14.4±3.9	0.0602
Onset of motor block (in mins	16.4±4.3	18.1±3.5	0.0561
Duration of sensory block (in hrs)	16.8±1.2	15.2 ±1.4	<0.0001
Duration of motor block (in hrs)	14.6±1.3	12.8±1.6	<0.0001
Duration of analgesia (in hrs)	20.2±2.8	17.3±3.1	<0.0001

The onset of motor and sensory block was comparable in both the groups. The duration of sensory block, motor block and duration of analgesia was significantly prolonged in group A. [Table 2]

Table 3: Postoperative VAS score

Post op	Group A (Ropivacaine + Dexmedetomidine) Mean SD	Group B (Ropivacaine+dexamethasone) Mean SD	P value
0 hr	0	0	-
2 hrs	0	0	-
4 hrs	0	0	-
6 hrs	0	0	-
8 hrs	0	0	-
12 hrs	0	0	-
16 hrs	0.8 ±0.4	2.8±1.3	< 0.0001
20 hrs	2.6±1.4	2.4 ±1.1	0.4795
24 hrs	3.2 ±1.2	3.6± 1.4	0.174

None of the patients in both the groups had pain till 12 hours (duration measured from the time the block was administered). VAS score was significantly lower in group A at 16 hrs. [Table 3]

Table 4: No of doses of rescue analgesia

No. of doses of rescue analgesia	Group A n = 40	Group B n = 40	P value
0	8	1	0.0289
1	32	39	

32 patients in group A required 1 rescue analgesia in comparison to 39 patients in group B (p<0.0289). [Table 4]

DISCUSSIONS

In this study, we found that the duration of sensory block, motor block, and duration of analgesia was significantly prolonged in dexmedetomidine group in comparison to dexamethasone group. Albrecht et al1 did a systematic review and meta-analysis of randomized trials and found a low quality of evidence that both dexmedetomidine and dexamethasone similarly prolong duration of

sensory and motor blockade when used as an adjuvant to local anaesthetics in regional blocks. Also, they observed that dexamethasone may be a superior adjuvant. This contrasts with our study and we observed that it was an indirect meta-analysis and there was no direct comparison of adjuvants. Of late, studies by Kaur M et al,[2] AN et al,[3] Singh N et al,[4] and Shoqier et al5 observed that the duration of block and the need for first rescue analgesia was significantly prolonged with dexmedetomidine in comparison to dexamethasone as an adjuvant to local anaesthetics in peripheral nerve blocks. Lee MJ et al,[6] observed that dexamethasone and dexmedetomidine were equally effective in terms of onset and duration of block following axillary brachial plexus block using nerve stimulation.

Postoperative VAS score was significantly lower in dexmedetomidine group and this corresponded with the duration of analgesia.

Though heart rate and blood pressure were lower in dexmedetomidine group, on intergroup comparison the difference was not statistically significant. Few studies have administered 2 mcg/kg or 100 mcg dexmedetomidine have observed higher incidence of hypotension and bradycardia and concluded that 50 mcg or 1 mcg/kg is a good balance between safety and efficacy.[7,8]

CONCLUSION

We can conclude that 1mcg/kg dexmedetomidine is superior to 8 mg dexamethasone as an adjuvant to ropivacaine in USG guided supraclavicular brachial plexus block as it provides longer duration of sensory block, motor block and duration of analgesia. Also, 1mcg/kg perineural dexmedetomidine does not cause significant adverse haemodynamic effects.

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