INTRODUCTION

Brachial plexus block has evolved into an excellent substitute to general anaesthesia for upper limb surgeries. By curtailing the stress response and using minimal anaesthetic drugs it provides intraoperative analgesia along with prolonged postoperative pain relief. Varied avenues of brachial plexus blockade exist namely interscalene, supraclavicular and axillary approach. With swift onset of dense anaesthesia of upper limb, supraclavicular brachial plexus block (SCBP) block is considered as the 'spinal of the upper limb surgery under ultrasound guided SCBP block with 30 ml of 0.5% ropivacaine were randomised into three groups. Group 1 (n = 20) received 1 µg/kg of dexmedetomidine, and group 2 (n = 20) received 8 mg of dexamethasone in addition to ropivacaine, while group 3 (n = 20) received only ropivacaine. The primary outcomes studied were onset and duration of sensory and motor block. Secondary outcomes included duration of analgesia, total analgesic consumption in 24 h postoperatively and quality of block. ANOVA and Chi-square test were used to compare results on continuous measurements and categorical measurements, respectively.

RESULTS

Onset of sensory and motor block was faster in group 1 (13.5 ± 4.1 and 17.0 ± 4.1 min) and group 2 (15.6 ± 3.6 and 18.5 ± 3.7 min) as compared to group 3 (20.1 ± 5.3 and 24.9 ± 5.6 min; P < 0.001). Block duration was significantly longer in group 1 and group 2 than in group 3. Duration of analgesia was prolonged in group 1 and 2 (1218.0 ± 224.6 and 1128.0 ± 207.5 min, respectively) as compared to group 3 (768.0 ± 273.7 min; P < 0.001). Twenty four hours analgesic consumption postoperatively was reduced in the two study groups.

CONCLUSION

Both dexmedetomidine and dexamethasone when used as adjuvants to ropivacaine for SCBP block, block onset time, and prolong block duration.

KEYWORDS

Dexmedetomidine, dexamethasone, ropivacaine, supraclavicular brachial plexus block, ultrasound

MATERIAL AND METHODS

Total 60 American Society of Anaesthesiologists (ASA) physical status I/II patients, scheduled for elective upper limb surgery below mid-humerus level, under ultrasound guided SCBP block were recruited in the present prospective, randomised, double blind, controlled study at Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar. Patients having significant coagulopathies, documented neuromuscular disorders, pre-existing significant systemic diseases, infection at block site, pregnancy and known allergy to study drugs, were excluded from the study.

Sixty eight patients were randomly allocated to one of the three groups.

Group 1: Ultrasound-guided SCBP block given with 30 ml of 0.5% Ropivacaine containing 1 µg/kg Dexmedetomidine.

Group 2: Ultrasound guided SCBP block given with 30 ml of 0.5% Ropivacaine containing 8 mg Dexamethasone.

Group 3: Ultrasound guided SCBP block given with 30 ml of 0.5% Ropivacaine alone.

Blinding and Randomisation

After enrolment, random allocation was done by the principle investigator who prepared sealed envelopes to maintain allocation concealment. The sealed envelopes were opened by study physician, who prepared drugs and handed them over to a blinded anaesthetist performing the block, who also monitored all the patients intraoperatively. Another blinded observer monitored the patients in the recovery room. At the end of the study, blinding was opened by the primary investigator.

Each patient was assessed preoperatively and was explained about the usage of visual analogue scale (VAS). On shifting to operation theatre, standard monitoring like pulse-oximeter, electrocardiogram and non-invasive blood pressure measurement was started. Intravenous (i.v.) access was achieved in the non-operative arm and SCBP block was performed under all aseptic precautions using ultrasound (Micromaxx, Sonosite) equipped with high frequency (6-3 MHz) linear probe. With the patient lying supine and head turned 45 contralateral, site was prepared and draped. Ultrasound transducer was placed in...
supraclavicular fossa in the coronal oblique plane to visualize brachial plexus in the transverse sectional view. Using a 25 gauge needle, 1–2 ml of local anaesthetic was injected. The block needle insertion was done using in-plane technique, from lateral to medial direction toward the brachial plexus and the study drug was injected incrementally to obtain a uniform spread around the brachial plexus.

Onset of sensory and motor block was assessed every 3 min till complete sensory or motor block or was described as sensory or motor block onset time. Complete sensory block was described as anaesthetic block score -2 on all the nerve territories. Complete motor block was described as the absence of voluntary movements (score - 2). Any failure in establishing the block was converted to general anaesthesia and that patient was excluded from further study. Intraoperative vitals were recorded every 10 min.

Quality of anaesthesia was graded by an anaesthesiologist who was unaware of the study drugs as: Excellent (4) No complain from the patient, Good (3) Trivial complains with no need of supplementary analgesia or sedation, Moderate (2) Complain that needed supplemental analgesia or sedation, and Unsuccessful (1) Patient requiring general anaesthesia. At the conclusion of the surgery, quality of anaesthesia was graded by an anaesthesiologist who was unaware of drugs used in block, as: Excellent (4) Perfect analgesia and muscle relaxation, Good (3) Good analgesia with acceptable muscle relaxation, Moderate (2) Satisfactory analgesia but poor muscle relaxation, Unsuccessful (1) Inadequate analgesia and muscle relaxation. Patient satisfaction was categorised as: Excellent (4) No complaint from patient, Good (3) Trivial complaints which are tolerable but relieved with intervention, Poor (1) Complaints that are neither tolerable nor relieved with intervention. Postoperatively, patients were monitored for sensory and motor block regression every 15 min till complete resolution. Time period from the end of LA administration to complete resolution of sensory block (score 0) on all the nerves was taken as duration of sensory block. Time period from the end of administration of LA to return of complete motor function (score 0) of the hand and forearm was defined as duration of motor block. Postoperative pain was assessed every 30 minutes for first 2 hours and then 2 hourly till 24 h, using 10 cm VAS.

Tramadol in a dose of 50 mg slow i.v. infusion with prior i.v. injection of 4 mg of ondansetron was administered either on demand of patient or when VAS score ≥4. After 30 minutes, if patient still felt pain/VAS score ≥4, same dose of tramadol was repeated. If pain was still not relieved, 75 mg of diclofenac sodium was given as slow i.v. infusion. Diclofenac sodium was given to a maximum of 100 mg in 4 h or 400 mg in 24 h. Diclofenac sodium as slow i.v. could be repeated after 8 h. The duration of analgesia was taken as the time interval from the end of LA administration to first rescue analgesic administration. Total amount of rescue analgesics used in 24 h after the block administration was noted. Sedation score was determined using Modified Ramsay Sedation Scale. Side effects and complications of technique and drugs were monitored and appropriately treated.

Statistical Analysis

Data was analysed using IBM SPSS software version 17. Age, height, weight, BMI, onset time of sensory and motor block and duration of surgery were studied by use of independent student t-test. The sex ratio, ASA grade and quality of anaesthesia were compared using Chi-square test. Non-parametric data like VAS are presented as median and interquartile range (IQR).

Pain scores and sedation score were assessed by making use of Mann-Whitney U-test for pair wise comparison. All tests were checked out for 95% confidence intervals. As sufficient literature was not available at the time of conduct of the study, power analysis was done using the software package, G Power. The alpha level taken for this analysis was P < 0.05. We used ANOVA using effect size as 1.330 for sensory block duration and power >80%, sample size of 60 was considered appropriate.

RESULTS

We surveyed 112 patients for eligibility, out of which 68 patients were randomised in three groups to receive ultrasound guided SCBP block. Sixty patients (20 in each group) were considered for final analysis. All three groups were analogous in terms of demographic data, duration of surgery and ASA physical status [Table 1].

<table>
<thead>
<tr>
<th>Table 1 : Demographic Data</th>
<th>Patients Variables</th>
<th>Groups</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
<td>37.6±13.0</td>
<td>38.8±14.0</td>
<td>43.0±15.6</td>
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<td>Weight (kg)</td>
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<td>67.5±9.3</td>
<td>69.4±9.8</td>
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<tr>
<td>Gender</td>
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<td>65%</td>
<td>65%</td>
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<td></td>
<td></td>
<td></td>
<td>Female</td>
<td>35%</td>
<td>35%</td>
<td>&lt;0.001</td>
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<tr>
<td>ASA Grade</td>
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<td></td>
<td>I</td>
<td>65%</td>
<td>70%</td>
<td>&lt;0.001</td>
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<td></td>
<td></td>
<td></td>
<td>II</td>
<td>35%</td>
<td>30%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Duration of surgery (h)</td>
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<td></td>
<td>118.8±52.1</td>
<td>126.5±39.2</td>
<td>95.0±40.1</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Values are expressed as mean±SD or number (% of patients).

Sensory and motor block onset times were significantly shorter, both in group 1 (dexametomidine) and 2 (dexamethasone) as compared to group 3 (control). The difference between group 1 and group 2 was not statistically significant. The duration of sensory and motor block was significantly longer in both group 1 and 2 than in group 3. Groups 1 and 2 were comparable with respect to durations of block [Table 2].

<table>
<thead>
<tr>
<th>Table 2 : Block Characteristics</th>
<th>Block Characteristics</th>
<th>Groups</th>
<th>F value</th>
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</thead>
<tbody>
<tr>
<td>Sensory Block Onset</td>
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<td>&lt;0.001</td>
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<tr>
<td>Motor Block Onset</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
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<tr>
<td>Sensory Block Duration</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
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<tr>
<td>Motor Block Duration</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
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</table>

Values are expressed as the mean±SD. Group 1=Ropivacaine + dexametomidine, Group 2=Ropivacaine + dexamethasone, Group 3=Ropivacaine + Saline SD=Standard Deviation, ASA=American Society of Anaesthesiologist

P<0.05 taken as significant

Postoperative pain was not significantly different in the three groups at most of the time points [Table 3].

The duration of analgesia was found to be notably prolonged in group 1 and group 2 compared to group 3. It was comparable between group 1 and 2 [Table 2]. The total analgesic (tramadol) consumption was maximum in group 3 (80.0±25.1 mg) and this was significantly more than group 1 (50.0±0.0 mg) and 2 (53.1±12.5 mg). On comparison between group 1 and 2, no significant difference was found.

The heart rate, systolic and diastolic blood pressure recordings were on lower side perioperatively in patients receiving dexametomidine in...
SCIブロックと他の2つの群を比較し、これは統計学的に有意でない。nstの発症は統計学的に有意でない。治療群の患者は、薬剤投与開始から麻酔効果の持続時間と感覚と運動麻酔の持続時間が延びた。これらの結果は、Damar et al.によって報告されたように、覚醒時の麻酔効果が有意に延びたとされている。

In a meta-analysis, nine randomized controlled trials (801 patients) were analysed in which 393 patients received dexamethasone (4–10 mg). Authors observed significantly prolonged duration of analgesia when dexamethasone was administered along with long acting LAs. In another study, patients receiving dexamethasone in SCBP block required significantly less diclofenac in 24 h postoperative period as compared to control group.

In our study, although both dexmedetomidine and dexamethasome were found to prolong analgesia when compared with control group. On comparison between these two adjuvants, no significant difference was found. This reduced requirement of rescue analgesic in the groups receiving adjuvants in first 24 h postoperative period is because of extended duration of sensory block. These results are tantamount to previous studies using dexmedetomidine or dexamethasone, however, explicit comparisons are arduous because of the heterogeneity of local anaesthetic mixtures and adjuvants used, multiple diverse techniques studied, and disparate means of assessing block duration.

In our study, a comparative study conducted by Kumar et al., using 0.5% ropivacaine with or without 8 mg dexamethasone, reported better (85%) surgeon satisfaction score in dexamethasone group as compared to control group (62.5%). In our study, perioperative heart rate and blood pressure recordings in patients receiving dexmedetomidine for block were on lower side, but this was statistically insignificant. No patient developed significant bradycardia. One patient of dexmedetomidine group developed hypertension after 50 min of giving block and was successfully treated with Inj. ephedrine 3 mg i.v.

In study by Swami et al., lower pulse rate and blood pressure recordings were observed with use of dexmedetomidine, but none of the patients required treatment. Esmaoglu et al. reported high incidence of bradycardia with use of dexmedetomidine with levobupivacaine in axillary block. They also reported significant hypertension in dexamethasone group, which was not seen in our study. Use of lower doses of dexamethasone (1 µg/kg), did not lead to development of significant bradycardia or hypertension in our study, as also reported by many other studies.

Verma et al. found that dexmedetomidine with ropivacaine provides early onset of sensory and motor block with longer block duration in SCBP block as compared to dexamethasone. In an indirect adjusted meta analysis of 49 trials, authors found dexamethasone to be superior to dexmedetomidine as it prolonged the duration of analgesia by 148 minutes more than dexmedetomidine without the risks of hypotension or sedation. A handful of other direct comparative studies favour of dexmedetomidine over dexamethasone.

Our study has few limitations like use of fixed dose of dexamethasone (8 mg) as compared to per kg body weight dose of dexmedetomidine (1 µg/kg) , small sample size and postoperative follow-up period was restricted to 24 h. Another limitation of our study was that different patients underwent diverse surgeries of varying nature and time duration, different tissue handling by differing level of prowess of surgeons, possibly leading to inconsistent perioperative requirement of analgesia.

CONCLUSION
We conclude that addition of 1 µg/kg dexmedetomidine or 8 mg dexamethasone as an adjuvant to ropivacaine (0.5%) in SCBP block significantly shortens the sensory and motor block onset time and prolongs sensory and motor block duration. It delays the demand for first rescue analgesic, decreases overall 24 hour total analgesic requirement and improves the quality of block without any added major side effect. Dexmedetomidine use leads to enhanced patient satisfaction as it is associated with more sedation as compared to...
REFERENCES


