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A comparative on haemodynamic effect of ropivacaine vs ropivacaine plus dexmedetomidine in supraclavicular brachial plexus block: A randomized controlled double blind study in tertiary care centre

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Abstract
This primary aim of the study is to investigate the analgesic effect of ropivacaine in combination with dexmedetomidine versus ropivacaine alone on brachial plexus block to provide alternative anesthetic means for upper limb trauma surgery. This prospective, randomized and double-blinded study included total 60 patients of either sex with age between 18-60 years posted for various elective upper limb surgery and randomly allocated into 2 equal groups of 30 each. Control Group-R received injection ropivacaine (0.75%) 30 ml plus 1 ml normal saline and Group-RD received injection ropivacaine (0.75%) 30 ml plus dexmedetomidine 25 μg (1 ml) for supraclavicular brachial plexus block using the peripheral nerve stimulator. monitoring of vitals (systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR)), partial oxygen saturation ratio determined every 5 mins in 1st 30 mins and then every 15 mins during 1st hr followed by every 2nd hourly during 24 hrs. There was good haemodynamic stability in both groups. SBP and DBP in Group-R and Group-RD with *values* were comparable between the groups. The difference was statistically more significant.

Keywords: haemodynamic effect, ropivacaine

Introduction
With the dramatic increase in the number of automatic vehicles on the road, the incidence of various types of traffic traumas has been on the rise throughout India. Upper limb fracture is one of them. In order to alleviate severe pain in patients with upper limb fracture, analgesia by brachial plexus blockade is usually applied before surgery. However, due to a myriad of reasons, patients with upper limb fracture are usually very nervous and anxious before and during the operation, leading to heart rate (HR) decrease, blood pressure increase and even shock [1]. Compared with general anesthesia, brachial plexus regional anesthesia is the preferred approach of anesthesia for upper limb surgery because it is easy to perform, and patients can undergo the procedure in the waking state during the operation [2]. However, administration of appropriate analgesics is critical [3]. Increase perioperative risks and are not conducive to postoperative recovery [4, 5]. Ropivacaine is a new local anesthetic that inhibits neuronal excitement and conduction by inhibiting neuronal sodium channels [6].

It has a very strong analgesic effect as it can produce nerve blocking effect at low concentrations; its effect is long lasting, and its central nerve inhibitory activity is low, which makes it a commonly used anesthetic in nerve block anesthesia [7]. In addition, ropivacaine also has vasoconstrictive effect, thereby reducing absorption of drugs into the plasma and leading to a long lasting effect.

The drug is also one of the ideal anesthetics to relieve a variety of postoperative pain. Dexmedetomidine is a highly selective α2 adrenergic receptor agonist. It shows a high affinity for its receptor that is 7 to 8 times stronger than clonidine, which belongs to the same category. It also shows a fast onset time and long lasting effect. Clinically, dexmedetomidine is used as an analgesic, sedative and anxiolytic medication [8]. Studies have shown that dexmedetomidine also has a neuroprotective effect, possibly by increasing intravascular calcium levels and reducing the concentration of catecholamines [9, 10].

In this study, we evaluated the comparison of haemodynamic changes in between the ropivacaine in combination with dexmedetomidine versus ropivacaine alone in 60 patients requiring upper limb surgery.

Material and Methods
Source of data
60 patients admitted to Shadan Institute of Medical Sciences, satisfying the inclusion and exclusion criteria undergoing elective upper limb surgery were included in the study, after obtaining the ethical committee clearance.

Sample size
Sample size calculation was done based on a pilot study in which the duration of sensory blockade in Group R (control group) and Group RD (study group) was 338.0 $\pm$ 25.167 and 480.50 $\pm$ 111.229 minutes respectively and duration of motor block in Group R and Group RD was 301.05 $\pm$ 23.633 and 420.0 $\pm$ 103.667 minutes respectively and duration of analgesia in Group R and Group RD was 349.0 $\pm$ 36.463 and 566.0 + 84.520 minutes respectively.

It was estimated that a minimum of 26 patients in each group would be required to have a 92% power to detect a significant difference in the duration with 95% confidence interval. Taking into considerations any dropouts we had taken 30 patients in each group for the study.

Statistical analysis
Descriptive statistical analysis has been carried out in the present study. Results on continuous measurements are presented as Mean±SD and results on categorical measurements are presented in Number (%).

1. Proportions were compared using Chi-squares test of significance.
2. The student 't' test was used to determine whether there was a statistical difference between study groups in the parameters measured.

In the above tests the "p" value of less than 0.05 was accepted as indicating statistical significance. Data analysis was carried out using statistical package for social science (SPSS) and Microsoft word and Excel have been used to generate graphs, tables etc.

Duration of study
The study was conducted from December 2015 to June 2017.

Type of Study
A prospective randomized double blind study was conducted in patients of either sex requiring elective upper limb surgeries after obtaining an informed consent.

Inclusion criteria
1. Age : 18-70 years
2. American society of anaesthesiologists (ASA) physical status I – III.
3. Elective upper limb surgeries.

Exclusion Criteria
1. Patient refusal for procedure
2. ASA IV and V
3. Any bleeding disorder or patient on anticoagulants
4. Severe respiratory disease
5. Neurological deficits involving brachial plexus
6. Patients with allergy to local anesthetics
7. Local infection at the injection site
8. Patients on any sedatives or antipsychotics
9. Body mass index (BMI)>35.
10. Cardiac arrhythmias
11. Advanced heart block and/or severe ventricular dysfunction
12. Those on other vasodilators or negative chronotropic agents
13. Altered sensorium and/or CNS disorders
14. Pregnant and nursing women

60 patients scheduled for elective upper limb surgery were randomized and divided into two equal groups in a double blind fashion.

Group R (Control): Patients in this group (n=30) received 30 millillitres (mL) of 0.5% Ropivacaine + 1mL saline.

Group RD (cases): Patients in this group (n=30) received 30 mL of 0.5% Ropivacaine + 1 microgram (μg)/kilogram (kg) Dexmedetomidine reconstituted to 1ml.

Drug solution used and dosage
1. Ropivacaine 0.75% ampoule was used. 20ml of this was diluted to 30ml with 10ml of 0.9% normal saline to make it 0.5%. Ropivacaine was used in a dose not exceeding 3mg/kg.
2. Dexmedetomidine (100μg/mL: 1mL) was used. Dose of 1μg/kg taken by 1mL tuberculin syringe and reconstituted to 1ml was then added to the ropivacaine solution.

Drug solutions were prepared by an independent Anesthesiologist not involved in the study.

Instruments
A set containing following was used
1. Insulated stimulator needle: Stimuplex® A 22G 50mm (B Braun, Germany).
2. Peripheral nerve stimulator: SenStim ® MedilogiX.
3. ECG electrode.
4. Two 20 ml syringes
5. One tuberculin syringe
6. Sterilize gauze pieces, one sterile gauze holding forceps, sterile bowl for povidone iodine and one sterile drape.

Technique of supraclavicular brachial plexus block
All the patients received premedication with 150 mg of ranitidine and 8 mg of ondansetron orally on the morning of surgery. An intravenous access was obtained on the opposite limb and an intravenous drip was started before undertaking the procedure which continued throughout the length of the surgery. Baseline parameters noted. Continous Vital parameters were observed and documented from the Philips VM8 monitor throughout the procedure and oxygen was administered at a rate of 5L/min through an oxygen mask.
Intraoperative sedation was maintained with intravenous midazolam 1 mg, given prior to starting the procedure.

1. The supraclavicular brachial plexus block was performed by the classical approach using a single-injection, nerve-stimulator technique. The patient was kept in the supine position without a pillow, arms at his/her sides adducted and head turned to side opposite to the one being blocked. The patient was asked to flex the elbow and rest the forearm on the abdomen. The wrist was supinated so the palm of the hand faced the patients face.
2. Part of the neck was aseptically cleaned and draped.
3. The lateral (posterior) border of the sternocleidomastoid muscle (SCM) was identified and followed distally to the point where it met the clavicle. The point of needle entrance was about 1 inch (2.5 cm) lateral to the insertion of the SCM to the clavicle or one "thumb breadth" lateral to the SCM and 2 cm posterior to the midpoint of the clavicle. Palpation of the subclavian artery at this site confirms the landmark. The palpating index finger was placed at this site.
4. Local infiltration of 1ml of 1% lignocaine was given at the proposed puncture site
5. A stimuplex ® A 22G 50mm insulated needle was used to perform this technique. The needle was connected to peripheral nerve stimulator (PNS) by the electrode and was properly grounded with the help of an ECG lead. The electrical stimulation was started with an intensity of 2.0mA and a pulse width of 100□s. once the desired response was obtained-that is a muscle twitch of the fingers that is clearly visible – the current strength was reduced in increments of 0.2mA gradually to 0.6mA. If the desired response persisted at 0.6mA the drug

solution was injected. If the response as obtained at 0.4mA also, then the needle was repositioned to get a response at 0.6mA but not at 0.4mA
6. If there was no adequate response, the needle was moved anteriorly or posteriorly along the first rib to elicit a response.
7. Following the injection, the area was massaged to help the solution to track along the plexus.
8. During the conduct of the block and thereafter, the patient was observed vigilantly for any complications of the block and for the toxicity of the drugs injected

Prevention of deleterious effects

Following precautions were taken during conduct of the block-

1. Repeated aspiration before and after every 3-5ml injection to prevent intravascular injection.
2. Injection would be stopped if early signs of toxicity appeared.

The following parameters were studied

Time for first request for postoperative analgesic (duration of analgesia) was noted.

During the intraoperative period heart rate, systolic, diastolic and mean arterial pressure was noted every 5 minutes (mins) during the first 15 mins, then every 15 mins throughout the surgery and hourly thereafter. Intravenous paracetamol 1 gram was given 6th hourly for the first 24 hours. Intramuscular tramadol 50 mg was given as rescue analgesic if VAS>3. Inadequate sensory and motor blockade beyond 30 mins following the infiltration was considered as unsuccessful block.

Management of unsuccessful block

In the circumstance of inadequate or patchy action of the block, the block was supplemented with general anaesthesia. mIf in case surgery was unduly prolonged and the effect of the block wore off, rescue analgesia was given in the form of intravenous Fentanyl 1 µg/kg and infusion of Propofol 50-100 µg/kg/min or convert to general anaesthesia.

Other variables that were recorded are

1. Age
2. Gender
3. Weight
4. Height
5. Body mass index (BMI).
6. Coexisting diseases
7. ASA status
8. Medications patient is receiving
9. Type of surgery
10. Duration of surgery
11. Post-operative infection

Hypotension (systolic blood pressure more than 20% fall from baseline value), bradycardia (heart rate <50/min) and postoperative complications like nausea and vomiting were noted and treated appropriately.

Demographic data

There was no significant difference in the patient characteristics including age, gender, height, weight, body mass index, ASA grade, type of surgery and duration of surgery as summarized in Table 1.

Table 1: Comparison of demographic variables

Parameters	Group R (Mean ± SD)	Group RD (Mean ± SD)	P value
Age (years)	39.1 ± 14.4	39.67 ± 15.24	0.933
Gender (Male / Female)	18/12	18/12	1.000
Weight (kg)	62.133 ± 7.491	63.80 ± 10.791	0.296
Height (m)	1.62 ± 0.073	1.64 ± 0.081	0.240
BMI (kg/m^2)	23.481 ± 2.743	23.72 ± 3.966	0.629
ASA Grade (I/II/III)	15/2/13	15/5/10	0.432
Type of surgery orthopaedic/plastic	24/6	25/5	0.766
Duration of surgery	98.67 ± 38.213	92.00 ± 38.341	0.354

Haemodynamic study

The hemodynamic parameters taken into consideration were the heart rate, blood pressure (systolic, diastolic and mean), oxygen saturation and respiratory rate. The results obtained are given below as tables and graphs which compare the mean values of the parameters from the baseline and after the block initially at 5 minus intervals for 15 mins, then 15 minus intervals upto 120 minutes and then hourly till complete recovery. The results are compared between the groups. Various hemodynamic complications like hypotension, bradycardia are compared in both the groups.

Comparison of mean heart rate (HR) between the groups at different time intervals.

Table 2: Comparison of mean heart rate (HR) between the groups at different time intervals

	Group R (Mean ± SD)	Group RD (Mean ± SD)	p value
Baseline	85.8 ± 15.260	82.0 ± 14.809	0.336
5 MIN	84.6 ± 15.215	80.9 ± 15.442	0.345
10 MIN	83.7±14.876	75.8±14.380	0.040
15 MIN	83.7±14.987	74.2±13.464	0.012
30 MIN	82.9±14.164	72.4±11.610	0.003
45 MIN	80.5±13.771	72.1±13.208	0.020
60 MIN	80.1±13.699	73.3±12.083	0.047
75 MIN	81.3±12.917	72.6±12.645	0.010
90 MIN	80.2±12.693	71.7±11.715	0.009
105 MIN	80.4±13.011	72.2±12.073	0.014
120 MIN	83.3±13.246	73.4±12.422	0.004
180 MIN	83.2±13.790	73.3±12.683	0.005
240 MIN	81.9±11.890	73.3±10.373	0.004
300 MIN	82.4±11.380	74.0±10.785	0.004
360 MIN	83.7±12.135	74.6±10.327	0.003
420 MIN	81.5±11.791	74.9±9.102	0.019
480 MIN	82.3±11.083	75.4±10.043	0.014

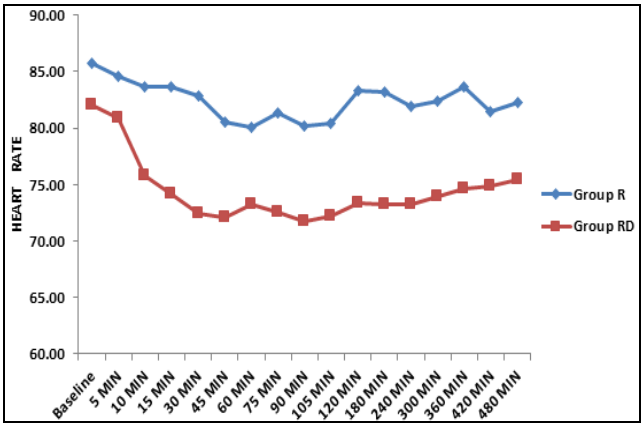

Fig 1: Line diagram comparing the mean HR between the groups at different time intervals

There was no statistically significant difference in mean HR between both the groups at baseline (p=0.336) and at 5 minutes (p=0.345). There was a statistically significant difference from 10 minutes onwards and thereafter (p<0.05) during follow up. Dexmedetomidine group had lower heart rate compared to the control group.

Comparison of mean systolic BP (SBP) between the groups at different time intervals

Table 3: Comparison of mean systolic BP between the groups at different time intervals

	Group R (Mean ± SD)	Group RD (Mean ± SD)	p value
Baseline	138.9±22.005	137.6±22.777	0.823
5 MIN	138.1±27.019	135.9±25.743	0.748
10 MIN	136.7±23.452	134.3±24.934	0.695
15 MIN	139.8±23.886	126.8±23.878	0.039
30 MIN	134.9±26.248	123.2±22.138	0.068
45 MIN	133.1±24.246	122.6±23.576	0.095
60 MIN	132.0±25.584	121.8±23.531	0.113
75 MIN	133.2±23.709	121.7±19.502	0.045
90 MIN	133.5±24.54	122.9±20.016	0.071
105 MIN	132.8±20.966	122.0±18.446	0.040
120 MIN	134.9±23.403	123.2±18.607	0.036
180 MIN	130.0±22.435	123.7±19.536	0.252
240 MIN	132.3±21.456	123.9±16.613	0.098
300 MIN	130.9±18.666	123.3±17.217	0.107
360 MIN	129.8±20.062	124.5±17.463	0.280
420 MIN	133.3±21.049	126.6±21.071	0.221
480 MIN	136.1±20.479	129.6±20.351	0.227

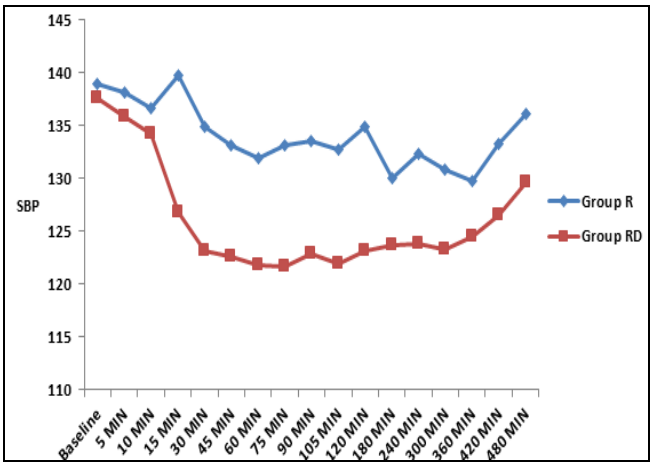

Fig 2: Line diagram comparing the mean SBP between the groups at different time intervals

There was no statistically significant difference in mean SBP between both the groups at baseline (p=0.823), 5 minutes (p=0.748), 10 minutes (p=0.695), 30 minutes (p=0.068), 45 minutes (p=0.095), 60 minutes (p=0.113), 90 minutes (p=0.071), 180 minutes (p=0.253) and thereafter. There was a statistically significant difference at 15 minutes (p=0.039), 75 minutes (p=0.045), 105 minutes (p=0.040) and at 120 minutes (p=0.036) during follow up. Dexmedetomidine group had lower systolic BP compared to the control group.

Comparison of mean diastolic BP (DBP) between the groups at different time intervals

Table 4: Comparison of mean diastolic BP between the groups at different time intervals

	Group R (Mean ± SD)	Group RD (Mean ± SD)	p value
Baseline	82.3±13.316	78.0±16.044	0.271
5 MIN	81.5±13.119	76.5±16.421	0.198
10 MIN	81.8±15.844	76.8±15.608	0.220
15 MIN	83.8±14.053	74.4±14.173	0.012
30 MIN	82.3±15.374	72.0±15.477	0.013
45 MIN	80.8±15.46	72.9±17.654	0.073
60 MIN	79.4±15.222	70.7±17.706	0.046
75 MIN	78.0±14.644	72.4±14.801	0.151
90 MIN	80.3±14.846	73.7±14.978	0.093
105 MIN	79.7±11.018	74.1+15.675	0.119
120 MIN	80.7±12.734	73.3±13.456	0.033
180 MIN	76.4±12.059	71.5±12.621	0.132
240 MIN	78.8±13.32	71.8±11.173	0.033
300 MIN	77.5±12.746	70.5±12.899	0.038
360 MIN	81.5±11.386	72.6±12.577	0.005
420 MIN	81.7±11.197	76.2±12.637	0.078
480 MIN	83.3±13.147	76.8±12.652	0.057

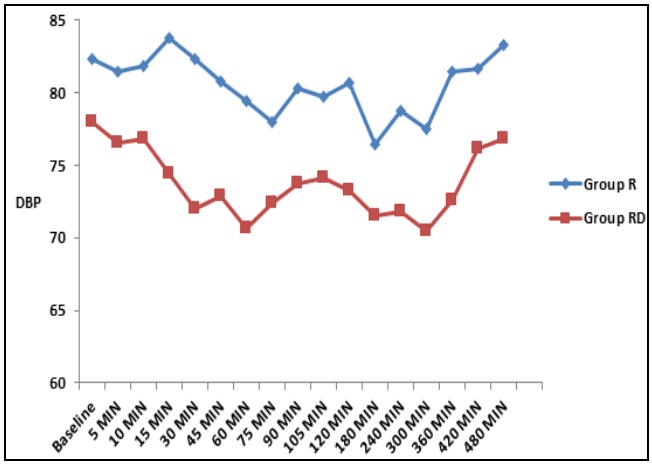

Fig 3: Line diagram comparing the mean DBP between the groups at different time intervals

There was no statistically significant difference in mean DBP between both the groups at baseline (p=0.271), 5 minutes (p=0.198), 10 minutes (p=0.0220), 45 minutes (p=0.073), 75 minutes (p=0.151), 90 minutes (p=0.093), 105 minutes (p=0.119), 180 minutes (p=0.132), 420 minutes (p=0.078) and thereafter. There was a statistically significant difference at 15, 30, 60, 120, 240, 300 and 360 minutes (p<0.050) during follow up. Dexmedetomidine group had lower diastolic BP compared to the control group.

Comparison of mean of Mean Arterial Pressure (MAP) between the groups at different time intervals.

Table 5: Comparison of mean of MAP between the groups at different time intervals

	Group R (Mean ± SD)	Group RD (Mean ± SD)	p value
Baseline	98.4±18.121	95.7±19.722	0.588
5 MIN	96.9±19.882	94.3±18.516	0.607
10 MIN	97.2±20.087	94.3±18.777	0.566
15 MIN	99.1±18.696	89.3±17.132	0.038
30 MIN	96.9±19.39	87.6±18.693	0.063
45 MIN	95.0±18.527	86.7±21.054	0.109
60 MIN	94.5±18.397	86.1±20.68	0.101
75 MIN	92.7±18.493	84.6±17.547	0.085
90 MIN	94.2±16.896	86.9±16.699	0.098
105 MIN	95.3±14.274	86.7±17.767	0.042
120 MIN	96.5±16.986	86.4±16.515	0.023
180 MIN	93.0±16.063	88.3±15.506	0.250
240 MIN	94.9±17.012	88.0±14.797	0.099
300 MIN	95.1±14.088	86.4±15.167	0.024
360 MIN	96.4±13.665	88.3±14.485	0.031
420 MIN	96.9±16.823	89.4±15.364	0.077
480 MIN	98.8±13.281	91.7±16.037	0.068

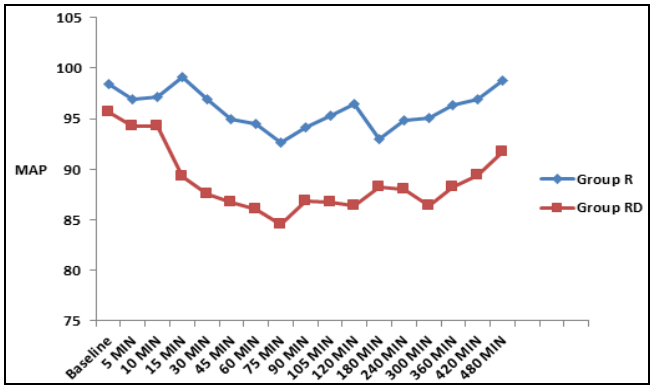

Fig 4: Line diagram comparing the mean of MAP between the groups at different time intervals

There was no statistically significant difference in mean MAP between both the groups at baseline (p=0.588), 5 minutes (p=0.607), 10 minutes (p=0.566), 30 minutes (p=0.63), 45 minutes (p=0.109), 60 minutes (p=0.101), 75 minutes (p=0.085), 90 minutes (p=0.098), 180 minutes (p=0.250), 240 minutes (p=0.099), 420 minutes (p=0.077) and thereafter. There was a statistically significant difference at 15,105, 120, 300 and 360 minutes (p<0.050) during follow up. Dexmedetomidine group had lower mean MAP compared to the control group.

Comparison of mean respiratory rate (RR) between the groups at different time intervals

Table 6: Comparison of mean RR between the groups at different time intervals

	Group R (Mean ± SD)	Group RD (Mean ± SD)	p value
Baseline	16.3±4.496	15.2±3.239	0.267
5 MIN	15.7±4.389	15.0±2.678	0.480
10 MIN	15.8±4.546	14.8±2.653	0.335
15 MIN	14.8±3.333	15.2±2.208	0.586
30 MIN	15.2±2.696	15.3±3.377	0.866
45 MIN	15.1±2.7	15.4±2.906	0.749
60 MIN	14.9±2.664	15.2±3.041	0.753
75 MIN	14.9±3.226	15.1±3.073	0.870
90 MIN	15.4±2.725	15.1±2.924	0.617
105 MIN	14.9±2.518	15.2±2.666	0.729
120 MIN	15.6±2.566	15.2±2.858	0.539
180 MIN	15.6±2.566	15.2±2.858	0.539
240 MIN	15.6±3.212	15.1±2.808	0.523
300 MIN	15.0±2.773	14.5±2.315	0.514
360 MIN	15.2±2.788	14.8±2.479	0.559
420 MIN	15.1±2.917	15.0±2.47	0.924
480 MIN	15.3±2.591	14.8±2.697	0.465

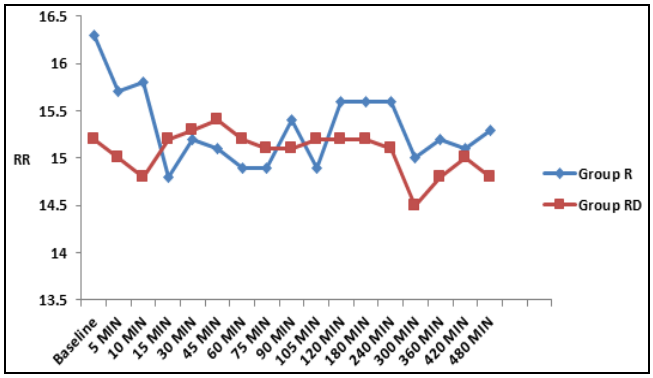

Fig 5: Line diagram comparing the mean of RR between the groups at different time intervals.

There was no statistically significant difference in the mean Respiratory Rate between the 2 study groups.

Comparison of mean SP02 between the groups at different time intervals

Table 7: Comparison of mean SP02 between the groups at different time intervals

	Group R (Mean ± SD)	Group RD (Mean ± SD)	p value
Baseline	99.3±1.202	98.7±1.964	0.210
5 MIN	99.2±1.297	99.3±0.702	0.712
10 MIN	99.3±1.022	99.4±0.615	0.761
15 MIN	99.3±1.337	99.4±0.621	0.622
30 MIN	99.3±1.184	99.3±0.75	0.897
45 MIN	99.4±1.037	99.4±0.615	0.880
60 MIN	99.6±0.568	99.4±0.615	0.196
75 MIN	99.6±0.621	99.3±0.606	0.098
90 MIN	99.5±0.682	99.4±0.556	0.410
105 MIN	99.4±0.932	99.3±0.606	0.744
120 MIN	99.5±0.507	99.3±0.606	0.171
180 MIN	99.5±0.572	99.3±0.596	0.190
240 MIN	99.5±0.681	99.3±0.596	0.317
300 MIN	99.5±0.63	99.3±0.64	0.160
360 MIN	99.5±0.571	99.3±0.64	0.094
420 MIN	99.5±0.629	99.3±0.691	0.246
480 MIN	99.5±0.629	99.3±0.547	0.384

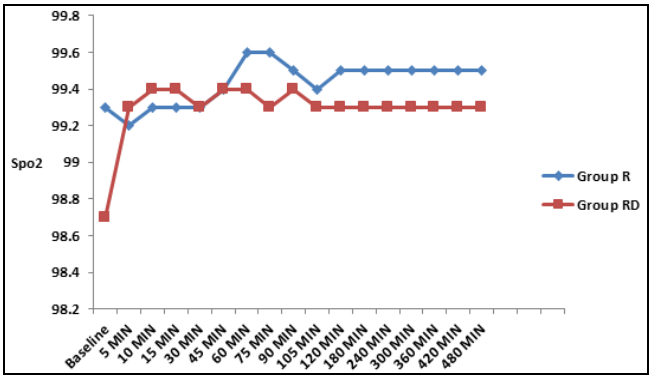

Fig 6: Line diagram comparing the mean of SPO_2 between the groups at different time intervals

There was no statistically significant difference in the mean $SP0_2$ between the 2 study groups.

Discussion

Dexmedetomidine is being used for intravenous regional anaesthesia (Bier's block), intravenous sedation and analgesia for intubated and mechanically ventilated patients in intensive care units and non-intubated patients for surgical and other procedures. It has been reported to improve the quality of intrathecal and epidural anaesthesia. Its use in peripheral nerve blocks has been described. However, the reports of its use in supraclavicular brachial plexus block are limited. In this study, we investigated whether adding dexmedetomidine to ropivacaine for supraclavicular brachial plexus block would affect the haemodynamic changes.

This study was a randomized, controlled, prospective, double blinded study. Sixty patients posted for upper limb surgeries were given brachial plexus block by supraclavicular approach. The patients were randomly allocated into two groups using standard randomization code. The Group R (control group) received ropivacaine 0.5% 30ml and 1ml of normal saline. The Group RD (cases or study group) received ropivacaine 0.5% 30ml and 1µg/kg of dexmedetomidine reconstituted in 1ml.

In this study, there was no statistically significant difference among the demographic data, duration of surgery and type of surgery between the study groups.

In our study haemodynamic parameters (HR, SBP, and DBP) were recorded at 0, 5, 10, 15, 20, 25, 30, 45 mins, 1st hr, 2nd hr and thereafter every second hourly till 24 hrs. There wasn't

Any incidence of fall in blood pressure more than 20 mmHg compare to baseline reading. No patient had respiratory depression, bradycardia or tachycardia. This shows that dexmedetomidine is not producing side effects like bradycardia and hypotension if it is used in small doses (less than 30 mg) as an adjuvant with local anesthetics in supraclavicular brachial plexus block.

Dexmedetomidine resulted in significant decrease in heart rate, mean arterial/systolic/diastolic blood pressures. However, bradycardia was transient and responded well to awakening the patient. The changes in blood pressure were without significant clinical impact and hypotension was easily managed with bolus of IV fluids and bolus mephentermine.

In dexmedetomidine group, the time for request of first dose of analgesic was significantly prolonged as compared to control group.

In our study the hemodynamic parameters were comparable in all two groups. Hemodynamic parameters (heart rate, systolic and diastolic blood pressure and mean arterial pressure) remained stable at all times in most of the patients both intra operatively and postoperatively in our study. Stable hemodynamic parameters were also reported by Murphy *et al*., Lohom *et al*., El Saied *et al*. and Duma *et al*. [12], however other studies found 30% fall in SBP with 300 µg, 20% fall with 90 µg and 15% fall with 30 µg clonidine.15 Similar to our study, S. singh *et al*., Duma *et al*. and kohli *et al*. concluded that 150 µg clonidine can be used as an adjuvant to bupivacaine in indoor patients without significant hypotension [13].

Conclusion

To summarize, from this study, it can be concluded that combination use of dexmedetomidine and ropivacaine in the brachial plexus block has a good analgesic effect. It can significantly improve vital signs such as HR, blood pressure and SPO_2, and can also reduce the incidence of adverse reactions; thus, its application is worth promoting widely.

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