Dexmedetomidineas an adjuvant to Ropivacaine for Supraclavicular Brachial Plexus Block

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ABSTRACTS

The study was done to evaluate the effect of two different doses of dexmedetomidine with ropivacainein classical supraclavicular brachial plexus blockade (posterolateral to subclavian artery). After randomization, 40 patients were divided into group A and group B having 20 patients each. In group A, 25 ml of ropivacaine (0.75 %) with 25 microgram of dexmedotmidine & in group B, 50 microgram of dexmedotmidine with 25 ml of ropivacaine (0.75 %) was given. Results showed that the mean sensory onset time in group A was 7.25 ± 5.95 min. & in group B was 8 ± 5.71 min. Mean motor block onset time in group A was 18.5 ± 5.15 min. in group B, 14.5 ± 5.35 MIN. effective analgesia duration in group A was 10.3±2.93 hour,and in a group B, 15.4 ±5.44 hour. Dexmedetomidine 25 microgram is a better combination since onset of sensory block is equally fast as with 50 microgram and negligible incidence of hypotension and bradycardia and nausea as compared to addition of 50 microgram.

Key words: *Supraclavicular brachial plexus block, Ropivacaine, Dexmedetomidine*

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INTRODUCTION

Although ultrasound & nerve stimulator have been used for regional anaesthesia, paresthesia based technique is still being practiced. Supraclavicular block (classical approach, injecting drug solution posterolateral to subclavian artery) provides anesthesia for the upper limb surgeries. Ropivacaine, (amide local anesthetic) is less lipophilic than bupivacaine& has a different stereospecific structure which means that chances of cardiotoxicity and CNS toxicity are less than than bupivacaine.(1)

Dexmedetomidineis an$\alpha_2$adrenoceptor agonist that has sedative, analgesic, sympatholyticproperties. Studies have shown that dexmedetomi-dine added to local anaesthetics improves the quality of block & prolongs the duration of analgesia.(2)

METHODS

This study was carried out as a prospective, randomized clinical trial on patients who underwent surgical procedures involving the distal arm and fore-arm at llrm medical college. Duration of study was July2014 to April 2015. Following institutional ethics committee approval, 90 ASA grade I& II patients, aged between 20 to 50 years, weighing between 50 to 80 kg were included in the study. After a thorough pre-anaesthetic evaluation, informed written consent was obtained from all patients selected for the study. Patients who did not consent for the procedure, or had any major hepatic, cardiopulmonary, renal, neurological disease, any contra-indication to supraclavicular block were excluded.

The study was a single centre, prospective, randomized double blind trial. Patients randomization was done (using a sealed envelope technique).

Patients were assigned in group A and group B.
Group A: patients received brachial plexus block with 30 ml of 0.75% Ropivacaine (3mg/kg). + 0.5ml Dexmedetomidine (25microgram)
Group B: Patientsreceived brachial plexus block with 30 ml of 0.75% Ropivacaine (3mg/kg) + 1ml Dexmedetomidine (50 microgram).

Heart Rate, systolic blood pressure(SBP), diastolic blood pressure(DBP), mean arterial pressure (MAP) oxygen saturation(spo2) were recorded as baseline values when patient arrived in OT.An intravenous line (18 G) was secured in the normal upper limb and Ringers lactate infusionwas started. Patients were premedicted with injection Midazolam 0.04mg/kg(i.v) and injection Ondanse-tron 4mg (i.v). All the base line vital parameters were compared with parameters taken immediately after performing block injection.

Sensory onset time was defined as the time interval between the end of total local anesthetic administration and complete sensory block (score 1).

Sensory block was assessed by pinprick test using a 2point scale.
0 = normal sensation to pin prick in both upper limbs.
1 = loss of sensation of pinprick

Sensory and motor blocks were evaluated every 5 minutes up to 30 minutes after injection.

Motor block was evaluated by following grades-

Grade	Assessment
0	Able to lift limb against resistance, gravity with normal power
1	Able to lift limb against resistance, gravity with less than normal power
2	Ability to lift limb against gravity, but not against resistance
3	Unable to lift limb against gravity

Duration of motor block was defined as the time interval between the supraclavicular block and the recovery of full power in relevant muscle group (grade 0). The block was considered partial when motor block was of grade 2. When motor block was of grade 1/0, it was considered a failed block & general anaesthesia was given.

RESULTS

In our study theobjective was to compare the effect of combination of two different dose of dexmedetomidine to Ropivacaine for supraclavicular brachial plexus block.Hemodynamic changes (in terms of heart rate, SBP & DBP),onset of sensory blockade, motor blockade, Duration of analgesia, were observed.

Table 1: Comparison of two groups for heart rate at different time intervals

S. No.	Time in min	Group A		Group B		Significance of difference
		Mean	SD	Mean	SD	P
1.	Baseline	85.9	7.66	87.4	9.27	0.5803
2.	15	84.2	8.65	77	14.06	0.0586
3.	30	80.6	12.58	89.35	9.98	0.0196
4.	45	78.88	12.39	87.84	7.60	0.0116
5.	60	79.62	12.33	87.25	7.89	0.0459
6.	75	83.66	14.56	89.33	11.07	0.4160

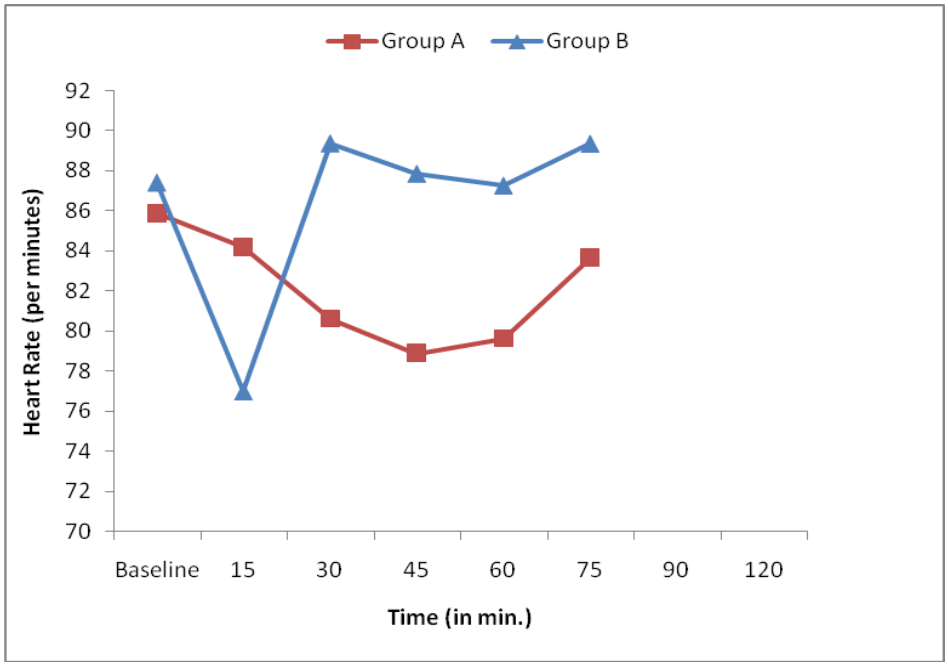

Table 2: Comparison of two group for SBP at different time interval

S.N.	Time in min	Group A		Group B		Significance of Difference
		Mean	SD	Mean	SD	
1.	Baseline	122.1	5.89	119.05	15.83	0.4246
2.	15	125	11.24	110.5	13.34	0.0007
3.	30	120.7	11.70	120.65	9.86	0.9884
4.	45	122.55	17.97	118.94	8.87	0.4403
5.	60	120.12	11.27	116.06	9.11	0.2712
6.	75	119.83	17.81	116.66	8.73	0.6894

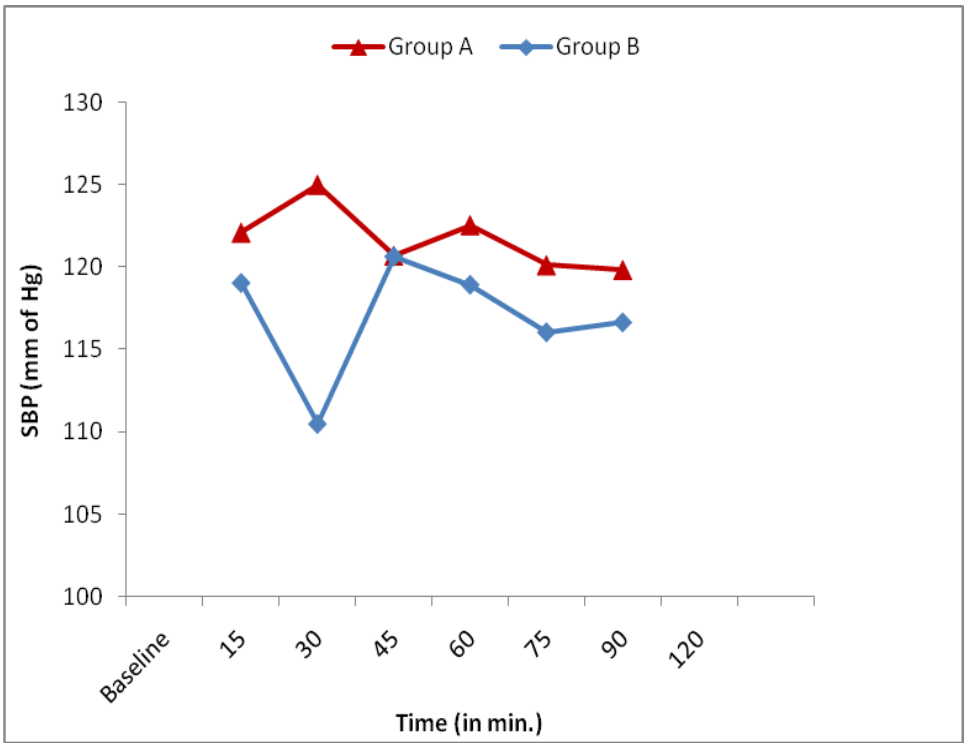

Table 3: Comparison of two groups for DBP at different time interval

S.No.	Time in min	Group A		Group B		Significance of Difference
		Mean	SD	Mean	SD	P
1.	Baseline	79.5	5.26	76.85	6.06	0.1483
2.	15	80.3	3.19	72.45	9.40	0.0011
3.	30	78.7	6.19	80.4	8.29	0.4675
4.	45	77.55	9.31	74.31	14.77	0.4334
5.	60	76.75	7.22	76.12	8.34	0.8223
6.	75	77	6.68	74.33	5.12	0.4055

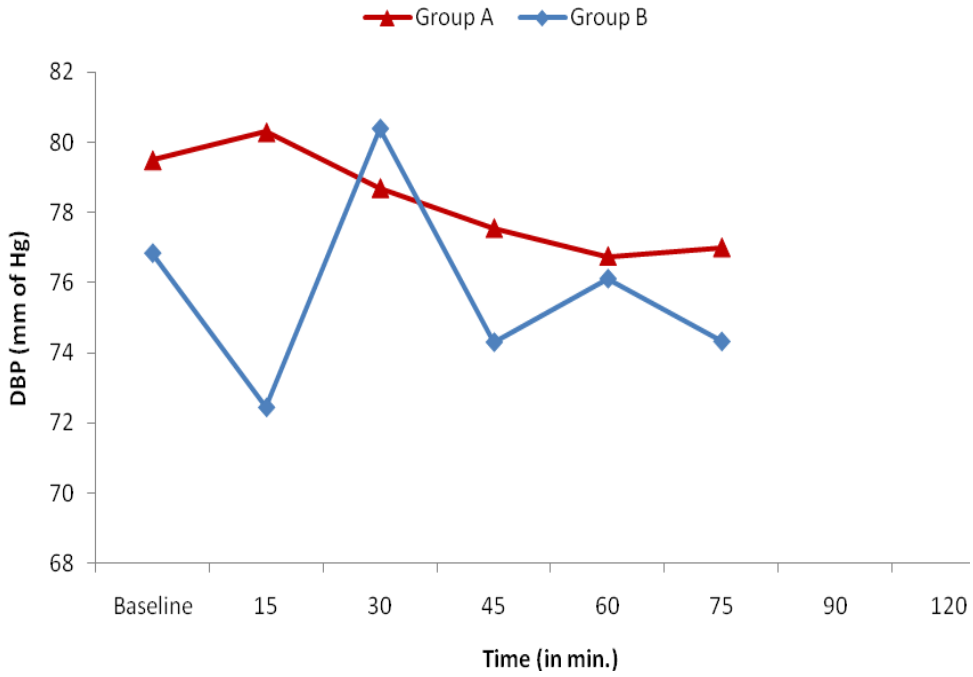

Table 4: Distribution according to demographic profile

	GROUP A	GROUP B	P Value
Age (years)	37.45±12.55	30.7±12.8	0.1010
Sex Ratio (M/F)	17/3	17/3	>0.05
Weight (kg)	54.3±4.16	55.6±3.2	0.0433
ASA Grade (I/II)	16/4	15/5	0.6867
Base Line Heart rate(per minute)	85.9±7.6	87.4±9.27	0.5803
Base Line SBP (mm of Hg)	122±5.8	119±15.8	0.4246
Base Line DBP (mm of Hg)	79.5±5.26	76.8±6.06	0.1483

Table 5: Characteristic of sensory and motor block in groupA and group B

	Group A Mean±SD	Group B Mean±SD	P value
Onset of sensory block (min.)	7.25±5.95	8±5.71	0.6867
Onset of motor block (min.)	18.5±5.15	14.5±5.35	0.0211
Duration of analgesia (hours)	10.3±2.93	15.4±5.44	0.0007

Supplementation	Group A		Group B	
	No.	%	No.	%
General Anaesthesia	1	5	2	10
Fentanyl	2	10	1	5
Ephedrine	0	0	2	10
Atropine	0	0	5	25

DISCUSSION

Three patients required general anaesthesia as adequate motor block was not achieved even after 30 minutes. This could be due to use of blind supraclavicular block technique which might have resulted in improper injection of drug. Fentanyl (100 microgmiv) was given in three patients as patient complained of pain during the procedure. Pain was not complained at time of skin incision but during the handling of affected bone by the surgeon.Hypotension

was defined as >20% fall in baseline systolic blood pressure.Bradycardia was defined as HR < 50/min.

Ephedrine,atropine were required in 7 patients in group B. Dexmedetomidine induced sympathetic block might have resulted in bradycardia, hypotension. Although all patients responded but higher dose of dexmedetomidinecan cause hemodynamic instability.(3) Addition of dexmedetomidine to ropivacaine, prolongs the duration of analgesia in both the groups but at lower dose (25µg) of dexmedetomidine have minimal side effects.At higher dose (50µg) of dexmedetomidine more side effects such as bradycardia and hypotension were present. Sarita S Swami et al compared clonidine and dexmedetomidine as an adjuvant to local anesthetic agent in supraclavicular brachial plexus block. Clonidine 1 µg/kg and dexmedetomidine 1 µg/kg were added to Bupivacaine 0.25% (35 cc). The results found were that duration of sensory block and motor block were 227.00±48.36 min and 292.67±59.13 min, respectively with clonidine, &413.97±87.13 min and 472.24±90.06 min, respectively with dexmedetomidine. (4). The average time of onset of sensory blockade is 14.20 ±5.229 min in group A and 7.20±2.483 min in group B. This difference was statistically significant (P=0.0001). Dexmedetomidine prolonged the surgical anesthesia and extended duration of analgesia as well as shortened the onset of sensory and motor blockade significantly. Brummett CM et alfound that dexmedetomidine when added to ropivacaine in peripheral nerve block caused approximately a 75% increase in the duration of analgesia.(5,6,7)

In our study the mean onset of sensory block in Group A was 7.25 ±5.95 min. & in group B ,8.0±5.71 min.In our study mean onset of motor block in Group A was 18.5±5.15 min as compared to Group B in which mean onset of motor block was 14.5±5.35 min, The average duration of sensory blockade is 310.37±66.359 in group A and 435.87±102.309 min in group B respectively The average duration of motor blockade is 278.50 ±66.887 min. in group A and 390.47 ±107.868 min in group B The average duration of analgesia is 378.53±80.933 min and 970.83±237.623 min in groups A and B respectively .In our study, duration of Analgesia in Group B was significantly longer, which was 15.45±.44 hour, as compare to Group A, which was 10.3±2.93 hour.The above differences were statistically significant between the groups. However, the incidence of complications requiring treatment was more in group B which affected our conclusion.

CONCLUSION

We concluded that with higher dose i.e. 50µg dexmedetomidine achieved faster onset of sensory, motor block and longer duration of analgesia but had higher incidence of complication such as hypotension and bradycardia. Block with low dose of dexmedetomidine i.e. 25µg has been considered a better combination since onset of sensory block was equally fast and acceptable but with added advantage of negligible incidence of hypotension, bradycardia as compared to addition of 50µg.

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