Comparision of Inj. Clonidine and Dexmedetomidine as an Adjuvant To Bupivacaine 0.5%(Plain) in Supraclavicular Brachial Plexus Block for Upper Limb Surgeries-A Clinical Study

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ABSTRACT

Introduction: Nowadays, α_2 agonists are readily used as adjuvants with local anaesthetic to prolong the duration of intrathecal, extradural and peripheral nerve blocks. We compared Clonidine and Dexmedetomidine as an adjuvant to Bupivacaine (0.5%) plain in supraclavicular brachial plexus block. VAS score and other block characteristics were observed at fixed interval and postoperatively.

Material and Methods: 75 patients of ASA grade I and II of age 20-60yrs posted for orthopedic upper limb surgery were enrolled and divided in to three groups of 25 each. Group I received 24ml Bupivacaine (0.5%) with normal saline while group II received Clonidine (150µg) and group III received Dexmedetomidine (100µg) in same volume.

Results: Duration of sensory and motor block was 298±53.01 and 310±60.8 min in group I while it was 425±71.19 min and 361.6±81.17 min in group II, and 494.2±114.7 min and 431.2±127.7 in group III respectively. Statistically, this difference was significant ($p<0.05$).

Conclusion: Clonidine and Dexmedetomidine added to Bupivacaine in supraclavicular brachial plexus block enhanced the duration of sensory and motor block and also the duration of analgesia. The time for rescue analgesia was prolonged in patients received Dexmedetomidine. Dexmedetomidine also enhances the quality of block as compared to Clonidine group.

Keywords: Bupivacaine, Clonidine, Dexmedetomidine, Supraclavicular brachial plexus block

INTRODUCTION

The perception of pain is a complex phenomenon that is influenced by the emotional state and past experience of the individual. By the end of the 19th century, the idea was firmly established that acute pain was a distinct sensory modality that was susceptible to interruption through conduction blockade with local anesthetics. Regional nerve blocks not only eliminate the pain but also facilitate surgery and attenuate the pain which follows.

Since the introduction of brachial plexus block in the practice, many local anesthetic drugs has been used, of which main drugs are lignocaine and Bupivacaine whose duration of action was limited.[1,2]

Many drugs have been used as adjuvants to local anesthetic agents to prolong the duration of peripheral nerve blocks. Clonidine, a partial α-adrenoceptor agonist and Dexmedetomidine α_2 agonists also has been reported to prolong the duration of anesthesia and analgesia during such blocks.[3,4] The α_2:α_1 selectivity of Dexmedetomidine is eight times that of clonidine and its high specificity for α_2 subtype makes it a much more effective sedative and analgesic agent.[4-7]

The aim of our study was to evaluate the effect of clonidine and Dexmedetomidine addition to 0.5% Bupivacaine (plain) in supraclavicular brachial plexus block on the onset, duration and quality of block for emergency and elective upper limb surgeries with lesser side effects and easy administration.

MATERIAL AND METHOD

This study was conducted after approval by our institution Research and Ethics committee and patient's written informed consent. A double blinded randomized prospective clinical study, a total of 75 patients of both sexes of age group 20-60yrs belonging to ASA grade physical status I and II posted for upper limb orthopedic surgeries were randomly allotted in 3 groups through "slips in a box technique" and supraclavicular brachial plexus block was given:

1. Group I (Control) (n=25): Inj. Bupivacaine 0.5% (plain) 24ml+ 1ml Normal saline.
2. Group II (n=25): Inj. Bupivacaine 0.5% (plain) 24ml + 1ml (150µg) inj. Clonidine
3. Group III (n=25): Inj. Bupivacaine 0.5% (plain) 24ml + 1ml (100µg) inj.dexmedetomidine

Patients with a history of significant neurological, psychiatric, neuromuscular, cardiovascular, pulmonary, renal, hepatic disease, history of alcoholism or drug abuse, pregnancy or lactating women, patients receiving adrenoceptor agonists or antagonists therapy or chronic analgesic therapy. Patients with morbid obesity, diabetes, peripheral vascular disease, suspected coagulopathy, known allergies or local infection and extremes of ages were excluded from this study.

All routine investigation like Complete blood picture, urine (routine and microscopic), blood urea, blood sugar, ECG, X-ray above 40 yrs were done prior to surgery. Relevant specific investigations were also done. Sensitivity test for local anesthetics was also done.

All the patients were thoroughly examined and all patients undergone pre-anesthetic check up prior to anesthesia.

Preoperative baseline HR (heart rate), BP (blood pressure), RR (respiratory rate), SPO_2 and ECG was noted. Patients were explained about the procedure and technique and informed

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consent was taken, kept nil orally for at least 6 hr prior to the procedure. In the non operative arm intravenous line was established.

Patients were put in supine position with head turned to non operated side and arm pulled down gently. A small wedge was placed below the shoulder to make the field more prominent. A point 1cm above the clavicle at junction of inner 2/3rd and outer 1/3rd of clavicle was chosen for the block.

Under all aseptic precautions, an intradermal wheal with 1ml 2% lignocaine plain at the selected point was raised. A 22G 1.5-in needle is directed just posterior to the subclavian artery pulse and the needle is advanced until the paresthesia elicited in the forearm. After this the calculated drug was injected after negative aspiration test to avoid intravascular injection.

Pulse rate, blood pressure (systolic/diastolic), respiratory rate, oxygen saturation, ECG, sensory and motor blockade were monitored every 5 minutes up to 30minute then every 15minute up to one hour and then at hourly intervals up to 12hrs.

Sensory block in the operative hand was assessed by using the pinprick test and compared with the same stimulation in the non-operative hand:

1. Normal sensitivity—0(no block)
2. Reduced sensitivity compared with the same territory in the contralateral upper limb—1(onset)
3. Analgesia or loss of the sharp sensation of the pinprick—2(partial)
4. Anaesthesia or loss of sensation to touch—3(complete)

Onset of sensory blockade was taken as the time between injection and complete ablation of pinprick test (sensory score-2).

Duration of sensory block was defined as the time from complete onset of block to return of the parasthesia (sensory score-1).

Motor blockade was assessed by a 3 point motor scale described by Bromage:

0 - Full flexion and full extension of elbow, wrist and fingers.
1 – Ability to move fingers only.
2 – Inability to move fingers.

Onset of motor blockade was defined as the time from the performance of block to the time when a complete inability to move fingers (score-2) was achieved. Duration of motor blockade was considered as time from complete motor block to the restoration of full flexion and extension of elbow, wrist and fingers (score-0).

Sedation was assessed by Chernik sedation score[8]:

0 - Completely awake
1 - Sleeping but responding to verbal command
2 - Deep sleep but arousable
3 - Deep sleep not arousable

Respiratory insufficiency was described as a respiratory rate of less 10 breaths per minute or oxygen saturation of less than 92%.

Postoperative analgesia was assessed by the 10 point visual analogue scale.[9] The postoperative analgesia was taken as time from onset of sensory block to time when patient has a visual analogue scale of ≥5.VAS score (0-10scale).

A careful watch was kept for complication such as bradycardia, hypotension, hematomas, headache, convulsion, respiratory insufficiency, pneumothorax, pruritis, nausea, vomiting and diaphragmatic paralysis due to phrenic nerve block.

At the end of surgery the residual effect of block and time of surgery was noted. The patients were shifted to wards and were visited to see the analgesia and vital parameters at defined time.

STATISTICAL ANALYSIS

Statistical analysis of data was done by using SPSS version (statistical package for social sciences) software. Unpaired t-test was applied for onset and duration of sensory and motor blockade, rescue analgesia and haemodynamic parameters. A p-value less than 0.05 is considered as significant ($) while >0.001 considered as highly significant.

RESULTS

There was no statistically significant difference between the demographic profile, ASA physical status of the three groups. Table-1 shows inter group analysis between three groups. Difference between group I and II, group I and III, and group II and III were statistically significant p (< 0.05).

Table-2 shows intergroup statistical analysis of onset and duration of motor blockade. Difference between group I and II, group I and III, and group II and III were statistically significant (p<0.05).

Table-3 shows time of rescue analgesia (Mean ±SD) of three groups. Time of rescue analgesia was 308.6 ±49.4 min in Group I, 425.2±71.19 min in Group II and 494.2±114.7 min in Group III.

Table-4 shows the in Group I, the Mean±SD VAS score was remain insignificant up to 3 hrs, thereafter VAS score significantly increased and remain on higher side throughout

Parameters	Mean(±SD)			P Value		
	Group I	Group II	Group III	I VS II	I VS III	II VS III
Onset of sensory blockade(min)	18.9±1.8	17.6±2.1	16.1±2.2	0.02$	0.00$	0.02$
Duration of sensory blockade (min)	298±53.07	425±71.19	494.2±114.7	0.00$	0.00$	0.01$
$ Statistically significant p ≤0.05; # Statistically insignificant p ≥0.05						

Table-1: Comparison of sensory blockade (min) between three groups

Parameters	Mean(±SD)			P Value		
	Group I	Group II	Group III	I VS II	I VS III	II VS III
Onset of motor blockade (min)	20.5±1.47	19.20±1.63	17.9±2.27	0.00$	0.00$	0.02$
Duration of motor blockade (min)	310±60.8	361±81.17	431.2±127.7	0.01$	0.00$	0.02$
Table-2 shows intergroup statistical analysis of onset and duration of motor blockade. Difference between group I and II, group I and III, and group II and III were statistically significant (p<0.05).						

Table-2: Comparison of motor blockade (min) between three groups

Parameters	Mean (±SD)			P Value		
	Group I	Group II	GGroup III	I VS II	I VS III	II VS III
Time of Rescue Analgesia (min)	308.6±49.4	425.2±71.19	494.2±114.7	0.00$	0.00$	0.01$

Table-3: Time for rescue analgesia (min) between three groups

VAS Score	Mean (±SD)			P Value		
	Group I	Group II	Group III	I VS II	I VS III	II VS III
10min	0.000±0.00	0.000±0.00	0.000±0.00	NA	NA	NA
4hrs	0.52±0.65	0.000±0.00	0.000±0.00	NA	NA	NA
5hrs	1.52±0.50	0.000±0.00	0.000±0.00	0.00$	NA	NA
6hrs	2.76±0.66	1.16±0.62	0.000±0.00	0.00$	NA	NA
8hrs	3.40±0.50	2.12±0.66	1.16±0.89	0.00$	0.00$	0.00$
10hrs	4.48±0.65	2.76±0.59	2.08±0.75	0.00$	0.00$	0.00$
12hrs	5.56±.50	3.92±0.86	3.04±0.78	0.00$	0.00$	0.00$
*NA-Not Accessible						

Table-4: Statistical analysis of VAS score (Mean±SD) between three groups

Sedation score	Group I		Group II		Group III	
	n	%	n	%	n	%
0	25	100	13	52	0	0
1	0	0	12	48	10	40
2	0	0	0	0	15	60
3	0	0	0	0	0	0

Table-5: Sedation score between three groups

Complications	Group I		Group II		Group III	
	N	%	N	%	N	%
Nausea	0	0	0	0	0	0
Vomiting	0	0	0	0	0	0
Respiratory depression	0	0	0	0	0	0
Bradycardia	0	0	5	20	5	20
Sedation	0	0	13	52	25	100

Table-6: Complications in groups

study while in Group II and III the mean VAS score was 0 up to 5-6hrs thereafter the VAS score remains lower as compared to Group I throughout the study. Difference between all the groups was statistically significant.

Table-5 shows that In Group I none of patients had sedation, Group II 48% of patients had sedation of grade 1,and Group III 60% of patients had sedation of grade 2 and 40% had sedation of grade 1.

Table-6 shows there was no complication in Group I while in Group II 20% and in Group III 20% patients had bradycardia and 52% in Group II and 100% in patients in Group III had sedation.

DISCUSSION

We observed that Clonidine 150µg and Dexmedetomidine 100µg added to Bupivacaine 0.5% plain in supraclavicular brachial plexus block as an adjuvant leads to significant prolongation of duration of analgesia and the time for rescue analgesia and lowers the VAS score indicating that Clonidine and Dexmedetomidine modified pain mechanics to some extent.[5,10]

In our study onset and duration of sensory block was found to be rapid and prolonged in group III respectively as compared to group I and II which was statistically significant ($p<0.05$).

Singh and Aggarwal also compared the effect of clonidine 150µg added to Bupivacaine and with Bupivacaine alone in brachial plexus block and observed that addition of clonidine resulted in faster onset of sensory block as assessed by VAS (43.60±22.15 vs 55.20±15.31) respectively at 5min.

Agarwal S and Gupta P also evaluated the effect of Dexmedetomidine added to 0.325% Bupivacaine for supraclavicular brachial plexus block. They observed a statistically significant prolongation of duration of sensory blockade ($p<0.001$) in Group SD (Bupivacaine +Dexmedetomidine) than Group S (Bupivacaine alone).

Our study showed significant differences in onset of motor block when Dexmedetomidine added to Bupivacaine plain as compared to clonidine and Bupivacaine group.[4,11,12] these differences were statistically significant. Khade A et al evaluated the effect of Dexmedetomidine added to Bupivacaine for brachial block and observed that onset of motor blockade was shorter (15±2.6min) in Dexmedetomidine group than Bupivacaine group (17.0±2.9min).[13]

Our results showed prolonged duration of motor blockade. Swami SS et al[20] also observed that Dexmedetomidine when added to local anaesthetic agent enhanced the duration of motor block (292.67±50.13min in Grp C while 472.24±90.06min in Grp D) as compared to clonidine.

The study of changes in VAS scores show that in clonidine and Dexmedetomidine group, pain score (VAS 0-10) was remain 0 up to 5-6hrs there after VAS remains lower as compared to plain Bupivacaine group.[5,9,14] Samy E. Hanoura et al also observed that the mean duration of VAS score was significantly lower with significantly longer duration of postoperative analgesia in Dexmedetomidine group compared with Bupivacaine group.

The time of rescue analgesia as assessed by VAS score was prolonged in Group III as compared to other group. On intergroup comparison these changes were found to be statistically significant.

In our study, we also observed significant changes in pulse rate ($p<0.05$) in Clonidine and Dexmedetomidine group.[6] Our observation are in accordance with findings of Kulkarnic et al observed a significantly lower PR in clonidine group as compared Bupivacaine group. Also Swami SS et al observed a significantly lower PR at 60, 90 and 120min (but not <60/min) in Dexmedetomidine group as compared with Clonidine group. There is significant hypotension is observed in groups

receiving Clonidine and Dexmedetomidine and these changes were statistically significant ($p<0.05$). These results were in accordance with some of the studies.[6,11,15]

The changes in the respiratory parameters (SPO_2 and RR) were found to be statistically insignificant between 3 groups.

We did encountered sedation in both Clonidine and Dexmedetomidine group but it was more in Dexmedetomidine group.[5,16,17] On statistical evaluation these were found to be significant.

No serious side effects are reported in Bupivacaine group.[11,16] The most common side effects observed in our study was bradycardia and sedation while sedation is present in all patients of Dexmedetomidine group.[5,16]

CONCLUSION

From this study we concluded that dexmedetomidine was safely used with local anesthetics and have longer duration of sensory and motor blockade with less haemodynamic effects as compared to bupivacaine alone and clonidine group.

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