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ORIGINAL ARTICLE

UTILIZATION OF CLONIDINE IN SUPRACLAVICULAR BRACHIAL BLOCK IN UPPER LIMB SURGERY AT UDAIPUR, RAJASTHAN

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ABSTRACT:
Aim: To compare the effect of clonidine v/s placebo as adjuvant to lignocaine for brachial plexus block, by supraclavicular approach, for different upper limb surgeries. **Methods:** The present study was conducted in 50 patients of ASA I or II status in the age group of 18 – 50 years at Pacific medical college and hospital, Udaipur, Rajasthan, India under brachial plexus block by supraclavicular approach for various upper limb surgeries, emergency or planned.Patients of both groups were assessed in terms of onset time of motor and sensory block, Perioperative hemodynamic status, Duration of post operative analgesia, Adverse effects of drugs if any etc. Data were analyzed using unpaired 't' test with p value <0.05 considered statistically significant. **Results:** The mean time of onset of sensory and motor block was significantly lower in Group B compared to Group A. Mean duration of motor block and sensory block are significantly longer in Group B than in Group A. No incidence of nausea, vomiting, hypotension, tachycardia or bradycardia were observed in any group. **Conclusion**: When clonidine 150 µg is added to local anesthetic solution in supraclavicular brachial plexus block, it provides rapid onset of block, better analgesia, good hemodynamic stability and profound & longer analgesia without any adverse effects.
Key Words: Clonidine, Supraclavicular, Udaipur, Upper limb

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INTRODUCTION

Acute postoperative pain is the result of a complex physiological reaction to tissue injury. The dorsal horn of the spinal cord is the site of termination of primary afferents and there is complex interaction between such afferent fibers, intrinsic spinal neurons, descending pain modulating fibers and various associated neurotransmitters such as serotonin, nor epinephrine, acetylcholine, adenosine, and glutamate in the dorsal horn.[1]

Local anesthetics administered as regional nerve blocks are utilized in providing postoperative pain relief in many surgical procedures by blocking signal traffic to the dorsal horn.Certain drugs like opioids, alpha2 adrenergic agonist, sodium bicarbonate, neostigmine, adrenaline, ketamine etc are used as adjuvant to local anesthetics to lower doses of each agent and enhance analgesic efficacy while reducing the incidence of adverse reactions.

Tramadol and fentanyl had been successfully used as adjuvants to local anesthetics in brachial plexus block.[2,3] The concurrent injection of alpha 2adrenergic agonist drugs has been suggested to improve the nerve block characteristic of local anesthetic solutions through either local vasoconstriction[4] and facilitation of C fiber blockade[5] or a spinal action caused by slow retrograde axonal transport or simple diffusion along the nerve. [6] Clonidine is a selective alpha 2 adrenergic agonist with some alpha 1 agonist property. In clinical studies, the addition of clonidine to local anesthetic solutions improved peripheral nerve blocks by reducing the onset time, improving the efficacy of the block during surgery and extending postoperative analgesia.[7, 8] Clonidine possibly enhances or amplifies the sodium channel blockade action of local anesthetics by opening up the potassium channels resulting in membrane hyperpolarization, a state in which the cell is unresponsive to excitatory input. [9]

Number of these studies has focused on the effect of clonidine as adjuvant to either lignocaine or mepivacaine.[10] Clonidine appears to have significant analgesic benefit and to cause minimal adverse effects when used as adjuvant for brachial plexus block in doses up to 150µg.

The present study is performed to compare the effect of clonidine v/s placebo as adjuvant to lignocaine for brachial plexus block, by supraclavicular approach, for different upper limb surgeries.

MATERIAL AND METHODS

The present study was conducted in 50 patients of ASA I or II status in the age group of 18 – 50 years at Pacific medical college and hospital, Udaipur, Rajasthan, India under brachial plexus block by supraclavicular approach for various upper limb surgeries, emergency or planned, after receiving institutional ethical committee approval. Exclusion criteria were for whom supraclavicular brachial plexus block or the study medications were contraindicated or those who had a history of significant neurological, psychiatric, neuromuscular, cardiovascular disease. On arrival in the operation theatre, usual monitors like ECG, Pulse oximetry, blood pressure cuff were applied and baseline pulse, blood pressure, oxygen saturation and respiratory rate were noted. Intravenous line was secured with 18 G intravenous cannula and inj. ringer lactate was started in all patients. Brachial plexus block was performed using a supraclavicular approach by classic technique.The patient was placed in the supine position, with the head turned away from the side to be blocked and the ipsilateral arm adducted. The interscalene groove and mid point of the clavicle were identified and a mark 1.5 to 2.0cm above and posterior to the midpoint of clavicle was made. Palpation of the subclavian artery at this site confirmed the landmark. After aseptic preparation of the area, a skin wheal was raised at the marked point with 1ml of lidocaine 2% subcutaneously, next standing at the side of patient, facing the patient's head, a 23 G – 3.75cm needle was directed in a caudal slightly medial and posterior direction. A nerve stimulator was used to locate the brachial plexus. The location end point was a distal motor response with an output lower than 0.7ma. On localization of the brachial plexus and negative aspiration of blood, the study medication was injected. The patients were randomly divided into two groups. Patients in group A received 30ml 1.5% lidocaine with adrenaline (1:200,000), 10ml bupivacaine 0.5% and 1ml saline while those in group B received local anesthetic with clonidine 150 µg. The assessment for onset of sensory and motor block was done every minute from the time of injection of test drug until the block was established. Sensory block was evaluated by pinprick test in hand and forearm where as motor block was assessed by asking the patient to flex the forearm and hand against gravity. Onset of sensory block was defined as the time elapsed between injection of drug and complete loss of pin prick sensation, while onset of motor block was defined as the time elapsed from injection of drug to complete motor block. Only patients with complete motor block were included in the study.

After the establishment of block, surgery was started and time of beginning of surgery was noted. Intravenous fluids were continued intraoperatively at a rate of 2 ml/kg/hour. Intra operatively, pulse, BP, SPO_2 and ECG were monitored every half hourly. Any complication like tachycardia, bradycardia, hypotension, nausea, vomiting, breathlessness, cough, discomfort and sedation were noted. During the procedure, anesthesia was considered satisfactory if patient did not complain of any pain or discomfort. Any patient requiring supplemental anesthesia was excluded from the study. All 50 patients were monitored for anesthesia and analgesia upto 15 hours in the post-operative period. Duration of sensory block (the time elapsed between injection of the drug and return of pinprick sensation) and duration of motor block (time elapsed between injection of the drug to complete return of motor power evaluated by finger and shoulder movement) were recorded. Intensity of postoperative pain was evaluated using VAS (Visual Analogue Scale), Grade 0 (No pain) to 100 (Worst pain). Analgesia was considered satisfactory if the score was 30 or less. If the score was more than 30, analgesia was judged unsatisfactory and rescue analgesic inj. Diclofenac sodium 75mg i.v was administered. Time for first analgesic was noted. Postoperatively, heart rate, blood pressure, respiratory rate, oxygen saturation and VAS were recorded at 0 min, 30 min, 1 hr, 2 hr, 3 hr, 4 hr, 6 hr, 9 hr, 12 hr and 15hr. Patients were observed carefully for any complications of supraclavicular block like pneumothorax, local anesthetic toxicity and complications of clonidine like sedation, bradycardia, nausea, vomiting etc. In each patient, a chest x-ray was done 6 hrs postoperatively to rule out pneumothorax. Any neurological complication was noted. Both groups were compared for the duration of satisfactory analgesia from the time when the block was performed and the time for first administration of rescue analgesic.Data were presented as mean values and mean $\pm$ S.D and analysed using unpaired 't' test with p value <0.05 considered statistically significant.

RESULTS

Table 1: Demographic Data

	Group A (n = 25)	Group B (n = 25)	P value	Inference
Sex (M/F)	20:5	20:5	>0.05	**NS**
Age (Years)	32.84 ± 9.542	32.4 ±10.01	>0.05	**NS**
Weight (kg)	**59.12 ±7.47**	**60.04 ±6.943**	**>0.05**	**NS**

No significant difference was seen in male-female ratio, weight and age of patients between both the groups.

Table 2: Onset of Anesthesia

Onset of Anesthesia	Group A	Group B	P value	Inference
Mean Sensory (min) Block	12.72 ±1.33	11.32± 0.852	<0.05	**S**
Mean Motor (min) Block	**6.48±0.82**	**5.98±0.89**	**< 0.05**	**S**

The mean time of onset of sensory and motor block was significantly lower in Group B compared to Group A.

Table 3: Duration of Analgesia and Anesthesia

Time(hrs)	Group A	Group B	P value	Inference
Mean duration of Motor Block	3.68 ± 0.33	7.15 ±0.53	<0.05	S
Mean duration of Sensory Block	4.59 ± 0.32	9.61 ±1.63	<0.05	S
Mean time of 1st analgesic	**5.62 ± 0.358**	**11.85±1.54**	**<0.05**	**S**

Mean duration of motor block and sensory block are significantly longer in Group B than in Group A.Mean time for Ist analgesic requirement for Group B is 11.85± 1.54 hrs and it is significantly longer than that in Group A (5.62± 0.358) hrs. P<0.05

Table 4: Intraoperative changes in Respiratory rate and Pulse rate (P>0.05)

Time (mins)	PULSE RATE (per min)		RESPIRATORYRATE (per min)	
	Group A Mean±S.D	Group B Mean±S.D	Group A Mean±S.D	**Group B Mean±S.D**
0	85.36±7.04	85.32 ± 7.134	15.24± 0.92	**15.28 ±0.98**
30	84.4 ± 6.58	84.02 ± 7.42	15.48 ± 0.91	**15.44 ±1.00**
60	85.28 ± 7.27	80.52 ± 7.06	15.52 ± 0.82	**15.4 ± 0.81**
90	83.83 ± 7.66	76.47 ± 7.91	15.67 ± 0.65	**15.21 ±0.91**
120	**89.5 ± 13.44**	**76.67 ± 11.29**	**16**	**14.83 ±0.98**

Table 5: Intraoperative changes in Blood pressure (P>0.05)

Time (min)	Group A		Group B	
	SBP(mmHg) Mean±S.D	DBP(mmHg) Mean±S.D	SBP(mmHg) Mean±S.D	**DBP(mmHg) Mean±S.D**
0	123.4±8.57	78.32± 5.40	122.16 ± 7.25	74.64 ± 6.61
30	123.48±8.62	77 ±5.36	118.56± 7.30	75.12 ± 5.41
60	121.08 ±7.30	78.24± 4.29	112±6.23	72.56 ± 5.36
90	120.25 ± 6.95	77.33± 2.87	109.78 ± 5.45	69.78 ± 4.15
120	**121 ±9.89**	**73 ±4.24**	**106.66 ± 7.65**	**69.66 ± 3.20**

Table 6: Postoperative changes in respiratory rate and pulse rate

Time (mins)	Pulse(per min)		Respiratory rate(per min)	
	Group A	Group B	Group A	Group B
	Mean±S.D	Mean±S.D	Mean±S.D	Mean±S.D
0	85.12±6.53	86 ± 8.69	15.32 ± 1.03	15.32 ±1.03
30	84.4 ± 6.24	83.6 ±7.81	14.92 ±1.32	14.92 ±1.32
60	84.48± 7.0	86 ± 8.06	14.88 ±1.30	14.88 ±1.30
120	84.08±6.36	85.36±6.72	15.28 ±1.02	15.28 ±1.02
180	84.16±6.45	84.24±6.00	14.84 ±1.28	14.84 ±1.28
240	84.08±6.51	83.52±5.33	14.92 ±1.22	14.92 ±1.22
360	84.24± 6.48	81.76±3.92	14.96± 1.207	14.96±1.20
540	84.4±6.11	81.6 ±3.95	14.96±1.06	14.96±1.66
720	**86.24± 6.11**	**81.36±4.68**	**14.84± 0.98**	**14.84 ±0.98**

Perioperative hemodynamic parameters were comparable in both the study groups, throughout the study period. No incidence of nausea, vomiting, hypotension, tachycardia or bradycardia were observed in any group. One patient in Group B had pulse rate<60/min which was clinically not significant and did not require treatment. No incidence of decline in SPO_2 perioperatively.

DISCUSSION

The present study was performed to evaluate the efficiency of clonidine when administered with a mixture of 1.5% lidocaine with adrenaline (1:200000) and 0.5% bupivacaine during supraclavicular brachial plexus blockade on postoperative analgesia in terms of first analgesic requirement.

It is crucial to select the appropriate dose of clonidine that can provide adequate surgical anesthesia and post operative analgesia with minimal side effects. Reviewing the various previous studies, 150 µg of clonidine was chosen as optimal dose for our study.

In present study, significant difference was seen between the onset of motor and sensory blockade between the two groups. The mean duration of onset of motor and sensory blockade was 6.48 ± 0.822 mins and 12.72 ± 1.33 mins respectively for Group A and 5.98 ± 0.89 mins and 11.32 ± 0.89 mins respectively for Group B. The onset of motor block was found to be faster than the onset of sensory block in the both groups. Winnie et al observed this also, and attributed this to the somatotrophic arrangement of fibres in a nerve bundle at the level of the trunks in which motor fibers are located more peripherally than sensory fibers. Bernard et al[8] mentioned in their study that each dose of clonidine 30, 50 and 300 µg used along with lidocaine reduced the onset of block when compared to lidocaine used alone in axillary brachial plexus block. Chakraborty et al[11] observed a faster onset of sensory and motor blockade in patients who received 30 µg clonidine with bupivacaine as compared to control in supraclavicular blockThese studies suggest that addition of clonidine in various doses, to local anesthetics in brachial plexus block hastens the onset of sensory and motor blockade.

In present study, there was no significant difference in the hemodynamics between the two groups perioperatively. In Singh et al[12] study, hemodynamics remained unchanged / stable in almost all pateints throughout study period in both the study group of clonidine with bupivacaine and bupivacaine alone. Except that there were lower heart rates in clonidine group, which was not significant. Chakrabortyet al[11] study also demonstrated no change in hemodynamic parameter with bupivacaine plus clonidine (30 µg) v/s bupivacaine alone. The mean duration of motor blockade was 3.68 ± 0.33 hrs in Group A and 7.15 ± 0.53 hrs in Group B.The duration of motor block was more in Group B ($P < 0.05$).The mean duration of sensory blockade was 9.61 ± 1.63 hrs in Group B and 4.59 ± 0.32 hrs in Group A and it was longer in Group B ($P < 0.05$). Eledjam et al[13] used clonidine 150 µg with bupivacaine in supraclavicular brachial plexus block and concluded that clonidine produces prolongation of motor and sensory block which was persisitant with present study findings.

Intensity of postoperative pain was evaluated using VAS (Visual Analogue Scale). The scale consists of a ruler with markings from 0-100 mm. The patient is asked to state their present perception of pain, assuring 0 to be no pain at all and 100 to be worst possible pain they could imagine.The duration of postoperative analgesia was assessed in terms of first analgesic requirement (VAS > 30).

In Current study, the time for first analgesic requirement in control group (GROUP A) was 5.62 ±

0.35 hours compared to 11.85 ± 1.54 hours in clonidine group (GROUP B) which means duration of postoperative analgesia was significantly more in Group B. ($P < 0.05$). Various studies evaluating the effects of addition of clonidine into brachial plexus block have been published; most of them reported prolongation of postoperative analgesia with clonidine; duration of which depends on dose of clonidine, type of local anesthetic used and technique of brachial plexus block performed. Singelyn et al[10] in their study concluded that the minimum dose of clonidine required to prolong significantly the duration of analgesia after brachial plexus block with mepivacaine 1% with epinephrine, is 0.1 µg/kg. Increased duration of analgesia was obtained with increasing dose of clonidine.

In present study no major side effects were noted in Group B intraoperatively except a decrease in heart rate to less than 60/min. in one patient which did not require any treatment.No side effects were noted in any Group A patients intraoperatively.

Postoperatively no complications were observed in any group. Although some patients in Group B were sedated, though it was not associated with any decrease in SPO2. Our study results are comparable to following studies. Most of the studies[7,14] supported our observation that clonidine at 150 µg was not associated with any major side effects other than sedation.

CONCLUSION

When clonidine 150 µg is added to local anesthetic solution in supraclavicular brachial plexus block, it provides rapid onset of block, better analgesia, good hemodynamic stability and profound & longer analgesia without any adverse effects. Clonidine is a good adjuvant to local anesthetic agent for brachial plexus block via supraclavicular approach for various upper limb surgeries.

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