Original Research Article

Comparison of clonidine adjuvants to ropivacaine in subclavian perivascular approach of supra clavicular brachial plexus block

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Abstract

Introduction: Brachial plexus block is sole anesthesia for upper limb surgeries. Several techniques have been used to prolong the duration of regional anesthesia.

The aim of the study: To compare the effectiveness of Clonidine as adjuvants to Ropivacaine in supraclavicular Brachial plexus block for prolonging the duration of motor blockade and prolonging the duration of analgesia.

Materials and methods: 60 Patients of ASA grade I and II undergoing upper limb surgeries were randomly assigned into two groups R and RC. Surgery was done under the subclavian perivascular approach of supraclavicular brachial plexus block. The patients in group R received 25 ml at 0.75% Ropivacaine with 1 ml Normal saline. In a group RC received 25 ml at 0.75% Ropivacaine and 1 ml of (150 micrograms) clonidine. Parameters observed were a time of onset at the sensory block and motor block, duration of motor blockade, and sensory blockade, duration of postoperative analgesia, sedation score and side effects.

Results: Addition of clonidine to Ropivacaine shows early onset of motor blockade compared to Ropivacaine alone. Addition of clonidine to local anesthetic solution significantly prolongs the duration of postoperative analgesia by 276 minutes compared to Ropivacaine alone. Addition of clonidine to Ropivacaine increased the duration of motor blockade by 132 minutes compared to Ropivacaine alone.

Conclusion: The addition of clonidine to the local anesthetic in supraclavicular brachial plexus produces the early onset of sensory and motor blockade and prolongs the duration of both sensory and motor blockade and postoperative analgesia, when compared to Ropivacaine alone.

Key words

Peripheral nerve blocks, Ropivacaine, Supraclavicular Brachial plexus block, Clonidine.

Introduction

Peripheral nerve blocks are gaining widespread popularity for perioperative pain management because of their distinct advantages over general and central neuraxial anesthesia. Brachial plexus block is sole anesthesia for upper limb surgeries [1]. Pain relief with PNB is devoid of side effects such as somnolence, nausea, vomiting, hemodynamic instability and voiding difficulties inherent to general and central neuraxial anesthesia [2]. A patient who undergoes surgery under PNB can bypass recovery room and be expeditiously discharged following outpatient surgery. The patient can position themselves on the operating table with little risk to the loss of airway and minimal personal effort. High degree of patient and surgeon satisfaction results because of superior pain control with a minimal side effect [3]. In 1911 Kullenkampff introduced the classic supraclavicular approach of brachial plexus block. Winnie and Collins introduced the subclavian perivascular approach to brachial plexus block. Several techniques have been used to prolong the duration of regional anesthesia. Besides the continuous infusion of local anesthetics through catheters and recent opioids as adjuvants to local anesthetic solutions [4].

Materials and methods

This study was conducted at Government Royapettah Hospital attached to Kilpauk Medical College. 60 patients of ASA grade I and II of either sex and age more than 20 years undergoing upper limb surgery (mostly orthopedic and plastic surgeries) were included. Patients allergic to local anesthetics and contraindicated to clonidine were excluded from this study. It was a double-blinded study in which patients were randomly allocated into two groups R and RC each comprising of 30 patients; surgery was done under supraclavicular Brachial plexus block. After ethical committee approval, informed consent was obtained from the patients. No premedication was given to the patients. Intravenous access was secured, Anaesthesia machine checked, resuscitative equipment and drugs were kept ready. The supraclavicular brachial plexus block was performed by subclavian perivascular approach using the Nerve Stimulator.

Group R: Patients received brachial plexus block with 25ml of 0.75 % Ropivacaine + 1 ml Normal saline

Group RC: Patients received brachial plexus block with 25ml of 0.75% Ropivacaine + 1 ml (150 microgram) of clonidine.

Care was taken so that the toxic doses of the local anesthetics were not exceeded according to the weight of the patients. Parameters observed were time of onset at sensory block and motor block, duration of motor blockade, and sensory blockade, duration of post-operative analgesia, sedation score and side effects.

Results

By statistical analysis of the two groups (R and RC) the age distribution (p 0.6147), sex distribution (p-0.0959), weight (p-0.8), ASA physical status (P-1.0) and duration of surgery (p-0.1534) were not statistically significant with p value more than 0.05.

No significant difference was observed with respect to pulse rate, systolic and diastolic BP and saturation. In both groups there was no incidence of hypotension, bradycardia and other side effects.

Onset of sensory block (in minutes)

Time taken for the onset of sensory blockade in group R (Ropivacaine) varied from 8 minutes to a maximum of 9 minutes with mean values of 8.6 minutes with a standard deviation of 0.5 minutes. In group RC (clonidine) it varied from 4minutes to 5 minutes with a mean value of 4.4 with a standard deviation of 0.5 (**Table – 1**).

Table - 1: Onset of sensory block in minutes.

The onset of Sensory Block (in minutes)	R Group	RC Group
Range	8 -9 minutes	4 – 9 minutes
Mean	8.6 minutes	4.4 minutes
SD	0.5 minutes	0.5 minutes
'P'	0.0001 Significant	

Onset of motor block (in minutes)

The onset of motor block varied from 10 minutes to 11 minutes in the (Ropivacaine) group R with mean 10.5 minutes and standard deviation of 0.5 min. In (clonidine) group RC it varied from 7 minutes to 10 minutes with a mean of 8.5 minutes and standard deviation of 0.8 (**Table – 2**).

Table - 2: Onset of motor block in minutes.

The onset of motor Block (in minutes)	R	RC
Range	10-11 minutes	7–10 minutes
Mean	10.5 minutes	8.5 minutes
S.D	0.5 minutes	0.8 minutes
'P'	0.0001 Significant	

Duration of sensory block (in hours)

The duration of sensory blockade in Group R varied from 8 hours to a maximum of 10 hours with a mean value of 8.9 hours and a standard deviation of 6 hours. In Group RC, varied from 10 hours to 12 hours with a mean value of 11.3 hours and a standard deviation at 0.7 (**Table – 3**).

Duration of motor block (in hours)

The duration of the motor blockade in group A varied from 6 to a maximum of 8.5 hours with a mean value of 7.3 hours and a standard deviation 0.6hrs. In Group B, varying from 9 hours to 11 hours with a mean value of 9.4 hours and standard deviation of 0.6 (**Table – 4**).

Table - 3: Duration of sensory block in minutes.

Duration of sensory block (in minutes)	R Group	RC Group
Range	8-10 hrs	10 -12 hrs
Mean	8.9 hrs	11.3 hrs
S.D	0.6 hrs	0.7 hrs
'P'	0.0001 Significant	

Table - 4: Duration of motor block in minutes.

Duration of Motor Block (in minutes)	R Group	RC Group
Range	6-8.5 hrs	9 -11hrs
Mean	7.2 hrs	9.4 hrs
S.D	0.6 hrs	0.6 hrs
'P'	0.0001 Significant	

Duration of analgesia

In Group R (Ropivacaine) with a mean value of 9.417 hours with standard deviation 0.602 hours. In Group RC (Clonidine) with a mean value of 14.08 hours with standard deviation 0.617 hours.

Discussion

Alpha-2 agonist like clonidine was introduced in the early 1960s as a nasal decongestant. During its use, a nasal decongestant, the antihypertensive property of drug was found out. Subsequently, more insights into the Pharmacological properties have led to its use in clinical anesthetic practice as well [5]. Clonidine assumes greater importance as anesthetic adjuvant and analgesic. Its primary effect is sympatholytic. It reduces peripheral norepinephrine release by stimulation of prejunctional inhibitory alpha -2 adrenoreceptors [6]. It inhibits central neural transmission in the dorsal horn by presynaptic and postsynaptic mechanism and directly in spinal preganglionic sympathetic neurons. Traditionally it was used as an antihypertensive drug but uses based on a sedative, anxiolytic and analgesic properties are being developed [7]. In 1988 Nakamura M, et al. reported that Peripheral analgesic action of clonidine mediated by the

release of endogenous enkephalins – like substances. On study reported that Alpha – 2 adrenergic agonists have an analgesic activity like a potent opioid, is anxiolytic and sedative as benzodiazepine, and sympatholytic and its action is reversible. Clonidine as adjuncts to local anesthetics for brachial plexus blockade may enhance the quality and duration of anesthesia and postoperative analgesia [8]. Clonidine has central analgesic action in addition to its peripheral anti-nociception by an alpha – 2 adrenoreceptors mediated local release of encephalin like substances [9]. Clonidine enhances both sensory and motor blockade of local anesthetics in peripheral nerve blockade and central neuraxial blockade. Clonidine blocks conduction in isolated neurons and intensifies the conduction of local anesthetics. Clonidine may modify the action of local anesthetics in the sodium channel either directly or indirectly [10, 11].

Mean onset of the sensory blockade in group R was 8.5 minutes and in group RC it was 4.4 minutes. The difference between the two groups was statistically significant with a p-value 0.0001 P >0.05. Mean onset of the motor blockade in group R was 10.5 minutes and in group RC it was 8.5 minutes. The difference between the two groups was statistically significant with a p-value 0.0001 P >0.05 [12]. On addition of clonidine to the local anesthetic solution (Ropivacaine), there was an earlier onset of sensory and motor blockade compared to Ropivacaine alone.

Mean duration of motor block R was 7.2+/- 0.6hrs and in group RC9.4 +/- 0.6 hours. The difference between the two groups was statistically significant with a p-value of 0.0001 (P<0.05). Addition of clonidine to the local anesthetic solution has a significantly prolonged duration of motor blockade [13]. These results correlate with on study [15], in clonidine (RC) group it was 721 minute compared to Ropivacaine ® group it was 552 min.

Mean duration of sensory block in group R was 8.9+/- 0.6 hours and in the group, RC was 11+/- 0.7 hours. The difference between the two groups was statistically significant with a p-value of 0.0001 (P<0.05) [14]. Addition of clonidine to local anesthetic solution prolonged the sensory blockade. These results correlate with one study, in clonidine group it was 628 min, Compared to Ropivacaine group ® it was 489 min [15].

The mean duration of analgesia is till the VAS score >5 and in group R it was 9+/- 0.6 hours and in group RC it was 14+/- 0.6 hours. The difference between the two groups was statistically significant with a p-value of .0001 (p<0.05). Addition of clonidine to local anesthetic (RC) solution prolonged the analgesia significantly when compared to Ropivacaine alone group [16]. These results correlate with one study [15], in clonidine group 14.2 hours R in Group R it was 9.6 hours. The mean duration of surgery in Group R it was 2.1 hours R in Group RC it was 1.9 hours [17]. The difference between the two groups was statistically not significant with a p-value 0.1534 (p<0.05).

The sedation score in both groups were noted. The sedation score in group R it was mean 2.0, in group RC it was mean 0.5. In clonidine group since the sedation score was not more than 3, the respiratory function was not compromised. So intra operative sedation is well observed in the clonidine group [18].

Conclusion

The addition of clonidine to the local anesthetic solution in the subclavian perivascular approach of supraclavicular brachial plexus block produces the early onset of sensory and motor blockade; prolongs the duration of both sensory and motor blockade; prolongs the duration of postoperative analgesia, when compared to Ropivacaine alone.

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