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EFFECT OF CLONIDINE AS AN ADJUVANT IN SUPRACLAVICULAR BLOCK FOR UPPER LIMB SURGERIES.

KEYWORDS: Diabetes mellitus, Dyslipidaemia, Cholesterol

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ABSTRACT

Background and aims- brachial plexus block is widely used as a regional anaesthesia technique for upper limb surgery. Various adjuvants have been studied to prolong the effect of block. This study is done to evaluate the effect of clonidine as an adjuvant to local anaesthetic mixture in supraclavicular brachial plexus block.

Methods- After institutional approval and informed consent, a comparative study of 50 patients (ASA Grade I/II) scheduled for various surgeries of upperlimb, either planned or emergency, under supraclavicular brachial plexus block. Patients were randomly divided into two groups of 25 each .Group A patients received 30ml lignocaine adrenaline 1.5%, 10ml 0.5% bupivacaine with 1ml normal saline and Group B patients received clonidine 150 µg (1ml) along with the local anesthetic agents in brachial plexus block. We analysed onset and duration of sensory and motor blockade, duration of post operative analgesia, any adverse reaction among patients.

Results-Onset of sensory block in group A and group B are 12.72±1.33 min and 11.32±0.85 min respectively. Onset of motor block in group A and group B are 6.48±0.82 min and 5.98±0.89 min respectively. The difference among both groups are statistically significant with P<0.001. Duration of motor block in group A and group B is 3.68±0.33 hrs and 7.15±0.53 hrs respectively. Duration of sensory block in group A and group B is 4.59±0.32 hrs and 9.61±1.63hrs respectively. The difference among both groups are statistically significant with P<0.001. The requirement of first post operative analgesia in group A is after 5.62±0.358 hrs and in group B is after 11.85±1.54 hrs which is statistically significant.

Conclusion- Clonidine in the dose of 150µg provides rapid onset , prolonged duration of block and excellent post operative analgesia.

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.

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.

The concurrent injection of alpha 2 adrenergic agonist drugs has been suggested to improve the nerve block characteristic of local anesthetic solutions through either local vasoconstriction and facilitation of C fiber blockade or a spinal action caused by slow retrograde axonal transport or simple diffusion along the nerve.

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. 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.

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 150 µg .

METHOD

The present study was conducted in 50 patients of ASA I or II status in the age group of 18 – 50 years under brachial plexus block by supraclavicular approach for various upper limb surgeries, emergency or planned, after receiving institutional ethical committee approval. Patients excluded from the study 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, pulmonary, renal or hepatic disease or alcohol or drug abuse, as well as pregnant or lactating women.

Detailed pre anesthetic check up , Routine laboratory tests like Hemoglobin, renal function tests, serum electrolytes, urine examination, random blood sugar and chest X-ray were done preoperatively. Patients were explained about the procedure in detail and written consent was obtained.All patients were instructed to fast for minimum 6 hours prior to scheduled time of surgery.

No patients received any sedative and narcotic premedication before arrival in operation theatre. 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 using peripheral nerve locator.

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. 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. Intra operatively, pulse, BP, SPO_2 and

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ECG were monitored regularly. 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.

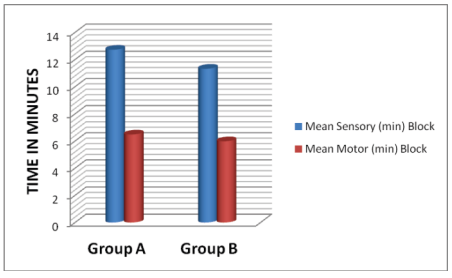
RESULTS

After studying 50 cases, observation and results are summarized in tabulated form and described below. Both groups comprised of 25 patients.Both groups were comparable in various demographic data.

Table 1: 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.



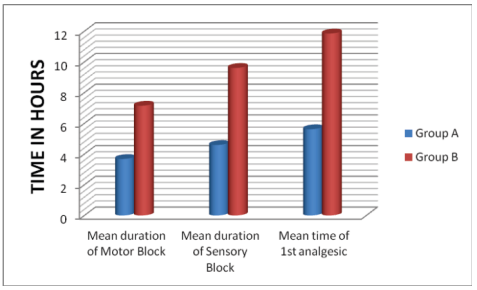
GRAPH

Table 2: 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 first 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



No incidence of nausea, vomiting, hypotension, tachycardia or bradycardia were observed in any group.

DISCUSSION

Supraclavicular blocks are performed at the level of the brachial plexus trunks. Here, almost the entire sensory, motor and sympathetic innervation of the upper extremity are carried in just three nerve structure (trunks), confined to a very small surface area. Consequently, typical features of this block include rapid onset, predictable and dense analgesia along with its high success rate.

Brachial plexus block via supraclavicular approach provides postoperative analgesia of short duration even when a long acting local anesthetic is used. Various adjuvant drugs like opioids, clonidine, neostigmine, hyaluronidase, midazolam, sodium bicarbonate have been evaluated in conjunction with local anesthetics to prolong the period of analgesia with supraclavicular block.

Clonidine and local anesthetic agents have a synergistic action. Clonidine enhances both sensory and motor blockade of neuraxial and peripheral nerves after injection of local anesthetic solution.This is thought to be due to blockage of conduction of A delta and C fibres, increase in the potassium conductance in isolated neurons in vitro and intensification of conduction block achieved by local anesthetics.

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.

ONSET OF SENSORY AND MOTOR BLOCKADE

In our 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.

Bernard et al[1] 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.

Singh S et al[9] in their study observed faster onset of sensory and motor block in patients who received bupivacaine plus 150 µg clonidine as compared to control in supraclavicular block.

These studies suggest that addition of clonidine in various doses, to

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local anesthetics in brachial plexus block hastens the onset of sensory and motor blockade.

Duration of Motor and Sensory Blockade

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).

Singh et al[9] and Eledjam et al[7] used clonidine 150 µg with bupivacaine in supraclavicular brachial plexus block and concluded that clonidine produces prolongation of motor and sensory block. Our study goes parallel to the findings of above studies.

Erlacher et al[6], Mjahed et al[8], Chakraboty et al[3], all observed prolongation of sensory and motor blockade with different doses of clonidine (upto 150 µg) used with local anesthetics in brachial plexus block.

El Saied et al[5] in their study compared ropivacaine and ropivacaine + clonidine 150 µg for axillary brachial plexus block and observed increase in sensory block from 489 min to 628 min with a mean difference of 138 min and motor block from 552 min to 721 min with mean difference of 170 min..

Duration of Postoperative analgesia

Intensity of postoperative pain was evaluated using VAS.Visual Analogue Scale (VAS,described by Aitkin) is easiest and most commonly used tool for assessment of pain.

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 our 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).

Eledjam et al[7] in their study demonstrated that clonidine 150 µg with bupivacaine (Group I) produced prolonged analgesia compared to bupivacaine with epinephrine 200 µg (Group II). Duration of analgesia was significantly more (994.2 ± 34.2 min (Group I) v/s 728.3 ± 35.8 (Group II) P < 0.001).

Chakraborty et al[3] in their study used bupivacaine with clonidine v/s bupivacaine alone and demonstrated significant prolongation of postoperative analgesia after supraclavicular block (495.4 ± 38.18 min (clonidine group) v/s. 194.2 ± 28.74 min (control group).

Similar observations were made by Singh et al[29] with clonidine (150 µg) + bupivacaine for supraclavicular brachial plexus block.

Damien Murphy et al[4] evaluated 6 studies which used clonidine as adjuvant to local anesthetics in brachial plexus block and demonstrated that 5 of the 6 studies had supportive evidence of analgesic benefits of clonidine in brachial plexus block.

ADVERSE EFFECTS

Side effects commonly associated with clonidine are

- bradycardia (P < 20/min from baseline)
- hypotension (fall in SBP > 20%) of preoperative value)
- sedation,
- nausea.

Other side effects which may occur due to supraclavicular approach of brachial plexus block are pneumothorax, haematoma, discomfort, neurological sequelae.

In our study no major side effects were noted in both Groups intraoperatively as well as post operatively. Our study results are comparable to following studies.

Trivedi et al[10], Eledjam et al[7], El Saied et al[5], Erlacher et al[6], Singh et al[9], in their studies demonstrated that clonidine (150 µg) when used for brachial plexus block (axillary or supraclavicular approach) was not associated with any side effects.

Collin et al[2] in their review study concluded that clonidine has beneficial analgesic effects with limited side effects at doses upto 150 µg.

Above studies supported our observation that clonidine at 150 µg was not associated with any major side effects.

Conclusion

When clonidine 150 µg is added to local anesthetic solution in supraclavicular brachial plexus block, it provides rapid onset of block, prolonged duration of block, excellent postoperative analgesia without any adverse effects.

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