ORIGINAL RESEARCH PAPER

Anaesthesiology

KEY WORDS:

TO STUDY THE EFFECT OF ADDITION OF CLONIDINE AS AN ADJUVANT TO BUPIVACAINE FOR INCREASING THE DURATION OF AXILLARY BRACHIAL PLEXUS BLOCK: A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

Introduction : Clonidine enhance central & peripheral neural blockade when added to local anaesthetics. Objective is to compare the efficacy of addition of clonidine to bupivacaine with bupivacaine alone used in axillary brachial plexus block for upper limb surgeries in terms of prolonging the duration of analgesia as a primary outcome.

This study comprised of 60 patients of both sex in the age group 20-60years weighing 45-70kgs.

Patients were randomly assigned into two groups Group B and BC respectively

Axillary perivascular block was given with bupivacaine dosage @2mg/kg and addition of Clonidine as 1.5 µg/kg to bupivacaine using nerve muscle stimulator. The criterion of sensory block was determined by pin prick test.Motor block after the injection was calculated by the help of modified Lovet rating scale. Successful block criteria were confirmed on Vester Anderson criteria. Sensory and motor block determined immediately and at 5, 10, 30, 60, 120, 180, 240, 360, and 480 min after completion of the injection. Cut off time was taken as 1500min .

In our study we found an enhancement of perioperative analgesia and prolonged duration of recovery of sensation in the clonidine group, well beyond the pharmacological effect of bupivacaine alone.

Introduction:

Regional Anaesthesia (RA) is powerful tool on the anaesthesiologist's as safe, easy and rewarding to both patient and anaesthesiologist. Clonidine is a selective partial agonist of alpha–2 adrenoreceptors. The ability of alpha-2 agonists to enhance central & peripheral neural blockade when added to local anaesthetics has been demonstrated for more than a decade[1] Some studies mention that analgesia that follows axillary nerve blocks is prolonged by clonidine whereas some of the studies emphasize the possibility of nausea, bradycardia, hypotension and marked sedation due to addition of Clonidine[2]

Aim:

The aim of this study is to compare the efficacy of clonidine added to bupivacaine against bupivacaine alone used in Axillary brachial plexus block for upper limb surgeries.

Objective:

To compare the efficacy of addition of clonidine to bupivacaine with bupivacaine alone used in axillary brachial plexus block for upper limb surgeries in terms of prolonging the duration of analgesia as a primary outcome. As a secondary outcome, observe the side effects of both test & control group.

Materials and Methods :

After approval from the Hospital ethics committee, a randomized controlled study was conducted on adult patients undergoing upper limb surgeries.

After the sample size was estimated from the data of previous studies using an alpha level of 0.05 and a beta power of 0.90 to detect a significant difference of 2 h in duration of block, 60 patients were taken for the study.

Study was conducted on 60 cases randomly divided using a computer generated randomization list in to two groups of 30 each :-

Group I 30-40 ml of Bupivacaine 0.25% plus 0.150µg (Test Group) of Clonidine

Group II 30-40 ml of Bupivacaine 0.25% plus 1 ml of (Control Group) NaCl 0.9%

I) INCLUSION CRITERIA

a. ASA I&II
b. Both Male & Female
c. Age 17yrs and above
d. Upper Limb Surgeries

II) EXCLUSION CRITERIA

a. Patient not fulfilling eligibility criteria.
b. Lack of patient consent.
c. Patient allergic to Bupivacaine and/or Clonidine.
d. Pregnant or lactating women.
e. Patient on chronic analgesic/anticoagulant therapy.
f. Patient with history of neurological, psychiatric, renal or hepatic disease.

After receiving in the operation theatre, identification and placement of basic monitoring, intravenous line established with 18G intravenous catheter in peripheral line of the contralateral arm.

Patient was then placed in the supine position with head turned away towards the contralateral side. Arm to be blocked was placed at a right angle to the body and the elbow flexed to 90 degrees. The dorsum of the hand was made to rest on the pillow.The axillary pulse was identified and the area disinfected using alcohol based disinfectant.

The injection site was infiltrated with 1 ml of lidocaine 2% subcutaneously.

A 22-gauge, 40-mm, short bevelled, insulated,unipolar cannula (Pajunk, Geisingen, Germany) was connected to a nerve stimulator (Stimuplex HNS11TM,B. Braun, Melsungen, Germany) and

inserted immediately above the artery until the brachial plexus was located. Study drug was given in two 20 ml syringes which were labeled by the numbers, keys to which were available with the primary anesthesiology resident and guide. Patients were assigned the drugs randomly depending on computer generated slot.

Half the study drug was injected at a site at which a motor response was evoked and the remaining half was injected at a second site after relocation of the brachial plexus.

The location end point was a distal motor response with an output lower than 0.5 mA (t=0.3 ms; f=2 Hz). During injection,negative aspiration was performed every 6.5–7.0 ml to avoid intravascular injection.

Plexus block was considered successful when Vester-Andersen's criteria—at least two out of four nerve territories (ulnar, radial, median, and musculocutaneous) effectively blocked—were fulfilled.

Sensory and motor block of the musculocutaneous, radial,ulnar, and median nerve were determined immediately and at 5, 10, 30, 60, 120, 180, 240, 360, and 480 min after completion of the injection.

Patients were asked to note complete recovery of sensation, which was then verified by an anaesthetist or nurse.

The primary outcome measure was duration of analgesia .This was estimated as the time interval from placement of block till first injection of rescue analgesic was given.

Secondary outcome measures were duration of sensory and motor blockade Sensory block was determined by a visual analogue scale from 100 (no sign of sensory block) to 0 (complete sensory block). Sensory onset of each nerve was assessed by pin prick method

A pinprick sensation on the contralateral arm was scored as 100 points. Patients were requested to compare pinpricks

The duration of sensory block was defined as the time interval between injection and complete recovery of sensation which was first observed by the patient and then confirmed by the anaesthesia resident.

Assessment of motor blockade was determined according to a modified Lovett rating scale ranging from 6 (usual muscular force) to 0 (complete paralysis) as follows:

- 6 -normal muscular force
- 5 -slightly reduced muscular force
- 4 -pronounced reduction of muscular force
- 3 -slightly impaired mobility
- 2 -pronounced mobility impairment
- 1 -almost complete paralysis
- 0 -complete paralysis

Following muscle groups assessed

a. Thumb abduction for the radial nerve,
b. Thumb adduction for the ulnar nerve,
c. Thumb opposition for the median nerve and
d. Flexion of elbow for the musculocutaneous nerve.

Motor block onset was defined as a reduction of muscle force to 3 or less.Recovery from sensory block was noted at time when patient started responding to blunt end of needle. The duration of analgesia was taken from the time of the onset of block to the first complaint of pain.

In case of intraoperative pain or post operative pain with VAS>4, rescue analgesic Inj Ketamine 1mg/kg given .This was also associated with giving Inj Diclofenac sodium 3cc(75mg) intramuscularly as a rescue analgesic drug to relieve the pain(with Inj. Ranitidine 50mg given IV).Postoperative nausea or vomiting was treated with intravenous Ondansetron 4 mg.

Results

All patients included in this study ranged between 20-50 years of age. No statistically significant age difference was found between age group B and BC(P>0.05). Both groups were comparable for gender, weight, duration of surgery and types of procedure, with no statistically significant difference.

Duration of anaelgesia as a primary outcome was compared between the two groups

DURATION OF POST OPERATIVE ANALGESIA

TIME IN MINUTES	GROUP B		GROUP BC	
	No of cases	%	No of cases	%
0-120	00	00	00	00
120-180	10	33.33	00	00
180-240	16	53.33	00	00
240-300	04	13.33	00	00
300-360	00	00	00	00
360-420	00	00	17	56.3
420-480	00	00	13	43.33
Mean	195.96		414.61	

In Group B , 54% patients observed postoperative analgesia of duration <4 hrs while 56% patients in group BC experienced postoperative analgesia for >6 hrs.Mean duration of post operative analgesia in group B was 195.96 min Mean duration of post operative analgesia in group BC was 414.61 min .

RECOVERY FROM SENSORY BLOCK IN MINUTES

TIME IN MIN	Group B		Group BC	
	No of Cases	%	No of Cases	%
0-150	00	00	00	00
150-180	21	70	00	00
180-210	08	26.66	00	00
210-240	01	3.3	00	00
240-270	00	00	00	00
270-300	00	00	01	3.3
300-330	00	00	20	66.6
330-390	00	00	9	30

Duration of sensory block in70% of cases in group B was between 150-180 min while in 67% of cases in group BC was between 300-330 min .

RECOVERY FROM MOTOR BLOCK IN MINUTES

Time in Min	Group B		Group BC	
	No of Cases	%	No of Cases	%
0-120	00	00	00	00
120-150	05	16.66	00	00
150-180	21	70	01	3.33
180-210	02	6.66	01	3.33
210-240	02	6.66	06	20
240-270	00	00	14	46.66
270-300	00	00	08	26.66

Mean time of recovery from motor block in group B was167.16 min Mean time of recovery from motor block in group BC is 255.93 min.

Discussions:-

In our study, in group B 76% and in group BC 43% was males and 24% in groupB and 57% in group BC were females. Both the group were comparable.

In the study done by Duma et al mean weight in the bupivacaine group was 68 kgs and in the bupivacaine clonidine group was 75 kgs. Also, in the study done by Eledjam et al (1991) [99],Singelyn et al (1996) [72],the groups did not differ significantly in terms of weight.

Bernard et al assessed the dose range effect of clonidine added to lidocaine for brachial plexus block using axillary approach.

They concluded that with the temperature discrimination test,

blockade of the musculocutaneous was more pronounced at 10 min in the groups receiving clonidine than in the saline group with no differences between the doses of the clonidine. In our study the onset of motor block in groupB was 21±1min in comparison to 14±1 in group BC. This was statistically significant difference..

In present study, mean of postoperative analgesia duration in group B was 196 mins and in group BC it was 415 mins.

Total duration of postoperative analgesia with group B in 56% was between 180-240min and with group BC in 59% was between 360-420 min.

There was significant difference in total duration of post operative analgesia between group B and group BC (P<0.05).Total duration of postoperative analgesia in group BC was longer than in group B. Chawda et al observed mean total duration of analgesia 829±95 min with Clonidine group as compared to 760±65 min in epinephrine group. In these studies, it was observed that addition of Clonidine as adjuvant in brachial plexus block resulted in prolonged duration of postoperative analgesia. The mechanism of prolongation of local anesthetic action by clonidine when injected at peripheral nerve site is not known. Three mechanisms are postulated to play the role. First, clonidine may interfere with the vascular resorption of local anaesthetics by producing vasoconstriction. Secondly, clonidine may have a direct action on neural tissues, especially at the spinal level. Experimental studies have shown the existence of alpha2 pre and post synaptic adrenergic receptors in the substantia gelatinosa of the dorsal horn of the spinal cord. At this level, alpha2 adrenergic agonists are responsible for a reduction in the release of substance P from primary afferent neurons. This effect is caused by a cell membrane hyperpolarization resulting from enhanced potassium conductance. Finally, Clonidine may act on peripheral nerve alpha adrenoceptors and interfere at the presynaptic level with the spinal neurotransmission of pain and/or through a post synaptic alpha2 specific effect either direct or via the release of endogenous opioids.

It was observed from the present study that addition of Clonidine to Bupivacaine in Axillary Brachial plexus block provide good intraoperative anaesthesia, prolonged postoperative analgesia and markedly reduced consumption of analgesic in first 24hrs without any adverse effect.

Conflict of interest :- Nil

REFERENCES

1. Tsui BCH, Rosenquist RW. Peripheral Nerve Blockade.In:Barash PG, Cullen BF, Stoelting RK, Cahalan MK, Stock MC, editors. Clinical Anaesthesia. Third edition. Philadelphia: Lippincott Williams & Wilkins; 1996.p.537-540
2. Eledjam JJ, Deschodt J, Biel EJ, Lubrano JF, Chavarel P, d'Athis F, Ducailar J: Brachial plexus block with bupivacaine effects of added alpha-adrenergic agonists : comparison between clonidine and epinephrine. Can J Anaesth 1991; 38: 870-5.
3. Gaumann DM, Forster A, Griessen M, Habre W, Poinsot O, Della Santa D: Comparison between clonidine and epinephrine admixture to lidocaine in brachial plexus block. Anesth Analg 1992; 75:69-74
4. Gaumann DM, Forster A, Griessen M, Habre W, Poinsot O, Della Santa D: Comparison between clonidine and epinephrine admixture to lidocaine in brachial plexus block. Anesth Analg 1992; 75:69-74
5. Duma A et al Clonidine as an adjuvant to local anaesthetic axillary brachialplexus block: a randomized, controlled study British Journal of Anaesthesia 94 (1): 112–16 (2005).
6. Bernard JM, Macaire P. Dose-range effects of clonidine added to lidocaine for brachial plexus block. Anesthesiology 2007:87: 277–84.
7. Chawda PM, Sharma G: A clinical study comparing Epinephrine 200µg or Clonidine 90µg as adjuvants to local Anesthetic Agent in Brachial Plexus Block via Supraclavicular Approach J Anesth Clin Pharmacol 2010;26 (4) : 523-27.
8. Eledjam JJ, Deschodt J, Viel EJ, et al. Brachial plexus block with bupivacaine: effects of added alpha-adrenergic agonist: comparison between clonidine and epinephrine. Can J Anaesth 38:870-5, 1991