



ORIGINAL RESEARCH PAPER

Anesthesiology

AN EVALUATION OF THE EFFICACY OF ADDING CLONIDINE TO BUPIVACAINE IN INFRA-CLAVICULAR APPROACH OF BRACHIAL PLEXUS BLOCK

KEY WORDS: Invasive Fungal infections, Candidemia, Aspergillus, Respiratory intensive care unit

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ABSTRACT

AIM: To evaluate the effects of adding alpha adrenergic agonist Clonidine as an adjuvant to bupivacaine in blocking brachial plexus by infraclavicular approach.
Materials and Methods: 60 ASA I and II patients undergoing upper limb surgeries under infra clavicular brachial plexus block. They were randomly divided into two groups namely Group B, Group BC. Group B (Bupivacaine + normal saline) -30 patients received 38ml of 0.25% Bupivacaine and 2ml of normal saline. Group BC (Bupivacaine + clonidine) -30 patients received 38ml Of 0.25% Bupivacaine, 150µg (1 ml) of clonidine and 1ml of normal saline. The onset and duration of sensory and motor block, changes in mean blood pressure and mean pulse rate was assessed.
Observation and Results: The onset time of sensory block was less in group BC(14.76min) as compared to group B (17.70min), which was found to be just significant (p <0.05). The onset time of motor block is less in group BC (17.50mins) as compared to group B (22.03 mins). The difference in duration of sensory block between group BC (898 min) and group B (243 min) was found to be statistically significant (p<0.05). The difference in duration of motor block between group BC (820.66 min) and group B (196.16 min) was found to be significant statistically. The mean blood pressure in both groups was found to be comparable (p>0.05).
Results: The mean time of onset of sensory and motor block was faster in Group BC (14.76 ± 1.10 min, 17.50±0.86 min) than Group B (17.70±1.08 min, 22.03±1.49min) respectively.
Conclusion: Addition of 150 mcg of clonidine to 0.25% bupivacaine accelerates the onset of motor and sensory block, prolongs analgesia without any adverse effect in brachial plexus block for upper limb surgeries.

INTRODUCTION

Peripheral nerve blocks provide ideal operating conditions when used optimally. Adequately administered regional anaesthesia can not only provide excellent intra operative pain relief but also good post operative analgesia. The infra clavicular approach was first developed by Raj.

Bupivacaine is one of the commonly used local anaesthetic agent used for brachial plexus anaesthesia as it has longer duration of action. Numerous adjuvants like epinephrine, opioids, clonidine and neostigmine were used to prolong the duration of local anaesthetic agents.

The demonstration of alpha-adrenoreceptors in the peripheral nervous system prompted many investigations on the effects of using various alpha-adrenergic drugs in combination with local anaesthetics for peripheral nerve blocks to accelerate the onset and to prolong post operative analgesia.

This study was designed to evaluate the effect of adding clonidine to bupivacaine in brachial plexus block by infra-clavicular approach, with regard to the onset, duration of motor and sensory block, sedative effect and complications due to clonidine.

AIM OF THE STUDY

To evaluate the effects of adding alpha 2 adrenergic agonist Clonidine as an adjuvant to bupivacaine in blocking brachial plexus by infraclavicular approach, with regard to the following parameters: 1) Onset of sensory block. 2) Duration of sensory block. 3) Onset of motor block 4) Duration of motor block and 5) To study the associated complications of the adjuvant.

MATERIALS AND METHODS

This study was carried out in the orthopaedic, plastic surgery theatre, Thanjavur Medical college Hospital, Thanjavur.

A prospective double-blinded randomised control study conducted on 60 ASA I and II patients undergoing upper limb surgeries under infraclavicular brachial plexus block who fulfill inclusion criteria. The study was started after receiving institutional ethical committee approval and informed written consent from all the patients and they were randomly divided into two groups

namely Group B, Group BC.

Group B (Bupivacaine + normal saline) -30 patients received 38ml of 0.25% Bupivacaine and 2ml of normal saline.

Group BC (Bupivacaine + clonidine) -30 patients received 38ml Of 0.25% Bupivacaine, 150µg (1 ml) of clonidine and 1ml of normal saline

INCLUSION CRITERIA:

The following criteria were taken for including the patients in this study. ASA Status I and II, Age between 20 and 60 years Weight 50 - 70 kilograms, Surgeries on distal end of arm, forearm and hand

EXCLUSION CRITERIA:

- Patient refusal, Known allergy for the study drugs, Local infections, Coagulation abnormalities, Alcohol/drug abuse, Pregnant/lactating women.

MATERIALS & METHODS:

PRE OPERATIVE PREPARATION:

Patients were pre-operatively assessed and the procedure was explained to the patient. Written informed consent was obtained. They were assessed with particular attention to any contraindications. All patients were premedicated with Tab. Ranitidine 150mg 2 hours before surgery with sips of water.

On arrival of the patient in the operating room, monitors like pulse oximeter, non invasive blood pressure and ECG were connected and baseline values were recorded. An intravenous access was obtained in the opposite limb with 18G cannula.

INFRACLAVICULAR BRACHIAL PLEXUS BLOCK :

Patients were positioned supine with the head turned to the opposite direction of the limb to be anaesthetised. The arm to be blocked laid in a neutral position, along the body. Coracoid process was identified by palpation and a point marked 2 cm caudal and medial to it.

Using a sterile technique, insulated short bevel stimulating needle was inserted at the marked point perpendicular to

the skin and connected to nerve stimulator and was programmed with the following variables, current 2mA, frequency 1Hz. The needle was advanced to a depth of 3 to 7 cm. A twitch of pectoralis muscle is observed at a depth of 1 – 3 cm and indicates too shallow placement of the needle. The needle is further advanced until plexus stimulation occurs. The ideal end point for injection of the drug is elicitation of wrist flexion and extension or finger flexion and extension. When these desired motor responses were elicited, the strength of the current is gradually decreased to 0.3 mA, if the same responses were present even at 0.3 mA, drug was injected after negative aspiration.

In the absence of a desired response, the needle was redirected cephalad or caudad, but never medially to avoid the pleura. When these manoeuvres failed to result in desired motor response, the needle was withdrawn and the landmarks were reassessed and tried again.

EVALUATION OF THE BLOCK:

Evaluation of degree of blockade was done by Hollmen's scale.

HOLLMEN'S SCALE

Sensory blockade:

- 1- Normal sensation of pin prick
- 2- Pin prick felt as sharp pointed but weaker compared with the same area in the other limb
- 3- Pin prick recognised as touch with blunt object
- 4- No perception of pinprick.

Motor blockade:

- 1-Normal muscle function
- 2-Slight weakness in muscle function.
- 3-very weak muscular action .
- 4- complete loss of muscle function.

- Following the administration of the drug, patients were evaluated for the onset of sensory and motor blockade every minute.
- **Onset of sensory block: Time interval between administration of drug and absence of sensation to pin prick (Hollmen's ≥ 3).**
- Motor block was assessed by wrist flexion and extension or finger flexion and extension. Only patients with complete motor block are included in the study.

Onset of motor blockade: Time interval between administration of the drug and complete loss of muscle function (Hollmen's ≥ 3).

- **Duration of sensory blockade: Time interval between onset of complete sensory block and the onset of pain in the postoperative period.**
- **Duration of motor blockade: Time interval between onset of complete motor block and recovery of normal muscle power.**
- Failed block was managed with general anaesthesia .Those patients are excluded from the study.
- After confirmation that the block has taken up, surgery was started.
- Patient received supplemental O2 and intravenous fluids throughout the procedure.
- Sedation was assessed using Ramsay sedation score (6 points).

Anaesthetic toxic reactions including subjective and objective manifestations like circumoral numbness, tinnitus, twitching, convulsions, etc., were looked for and appropriate resuscitative drugs were kept ready.

- Complications associated with the technique like intravascular injection and pneumothorax were looked for and appropriate measures were taken to meet any such eventuality.
- Heart rate, non invasive blood pressure, oxygen saturation and sedation scores are recorded at 0 min, 30 min, 60 minutes, 2

hr, 4 hr, 6 hr, 12 hr and 24 hr.

- Diclofenac 75mg intramuscularly was given as a rescue analgesic when the patient complaints of pain in post operative period .
- Patients were observed for 24 hours for the following side effects: Bradycardia ; heart rate less than 60 beats per minute. Hypotension; more than 30% decrease from baseline value. Sedation, Shivering , drymouth , arrhythmias & local anaesthetic toxicity

All the data were subjected to statistical analysis. A p value less than or equal to 0.05 was considered statistically significant.

OBSERVATION AND RESULTS

The mean age of the patients (in years) in both group is comparable $p=0.541$ ($p > 0.05$) .

Majority of the patients in both groups were males. However , the distribution of both males and females in each group were comparable $p=0.376$ ($p > 0.05$).

The mean weight of the patients(in kg) in both groups were comparable $p=1.75$ ($p > 0.05$).

The mean duration of surgery in both groups were comparable $p=0.297$ ($p > 0.05$).

**TABLE 1
ONSET OF SENSORY BLOCK**

GROUP	MEAN	S.D	S.E
GROUP B(n=30)	17.70	1.08	0.198
GROUP BC(n=30)	14.76	1.10	0.201

STATISTICAL ANALYSIS

Paired t test	t value	df	p value
	12.50	29	0.042

This table shows the onset time of complete sensory block in groupB and group BC. The onset time of sensory block was less in group BC(14.76min) as compared to group B (17.70min). On statistical analysis this difference was found to be just significant ($p < 0.05$).

**TABLE 2
ONSET TIME OF MOTOR BLOCK**

GROUP	MEAN	S.D	STD.ERROR
GROUPB(n=30)	22.03	1.49	0.273
GROUPBC(n=30)	17.50	0.86	0.151

STATISTICAL ANALYSIS

Paired t test	t value	df	p value
	15.192	29	0.007

This table shows the onset time of motor block in group B and group BC .The onset time of motor block is less in group BC (17.50mins) as compared to group B (22.03 mins). On statistical analysis this difference was found to be significant. ($p < 0.05$)

GRAPH 1:ONSET OF MOTOR BLOCK

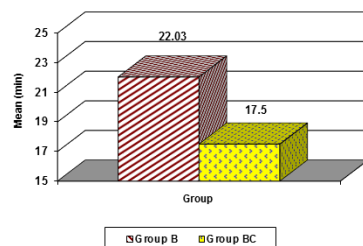


TABLE 3 DURATION OF SENSORY BLOCK

GROUP	MEAN	S.D	S.E
GROUPB(n=30)	243.67	12.21	2.04
GROUPBC(n=30)	898.65	19.04	3.47

STATISTICAL ANALYSIS

Paired t test	t value	df	p value
	-164.86	29	0.004

This shows the mean duration of sensory block in group B and Group BC. The difference in duration of sensory block between group BC(898 min) and group B(243 min) was found to be statistically significant(p<0.05).

GRAPH 2: DURATION OF SENSORY BLOCK

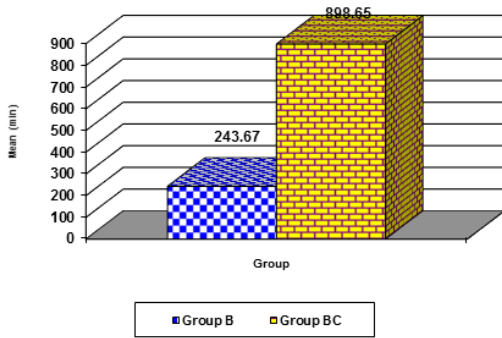


TABLE-4 DURATION OF MOTOR BLOCK

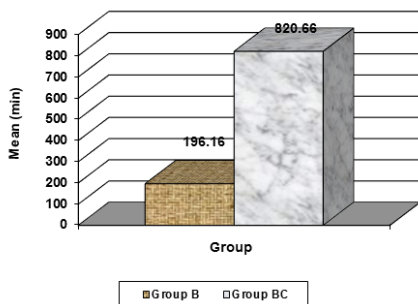
GROUP	MEAN	S.D	S.E
GROUP B(n=30)	196.16	9.53	1.74
GROUPBC(n=30)	820.66	13.11	2.39

STATISTICAL ANALYSIS

Paired t test	t value	df	p value
	-203.19	29	0.003

This table shows the mean duration of motor block in group B and Group BC. The difference in duration of motor block between group BC (820.66 min) and group B (196.16 min) was found to be significant statistically.

GRAPH 3: DURATION OF MOTOR BLOCK



The mean blood pressure in both groups was found to be comparable (p>0.05). None of the patients in both groups developed hypotension.

TABLE : 5 CHANGES IN MEAN PULSE RATE

	GROUP B MEAN	S.D	GROUP BC MEAN	S.D	p value
BASELINE	83.17	7.35	79.08	5.94	0.003
10 min	89.10	7.31	82.53	5.27	0.002
30min	80.12	7.48	68.20	3.74	0.004
1hr	79.09	7.87	66.90	3.58	0.001
2hr	79.13	7.86	67.20	3.74	0.003
4hr	78.30	7.69	67.53	4.65	0.002
6hr	81.30	6.30	69.57	5.02	0.004
12hr	84.65	4.36	75.10	5.35	0.004
24hr	86.20	4.30	76.10	5.40	0.002

Base line pulse rate in group B was 83.17 min and the mean pulse

rate in group B ranges from 89.17 min at 10 min to 79.07/min at 1st hour. The base line mean pulse rate in group BC was 79.08/min and the mean pulse rate ranges from 82.53/min at 10 min to 66.90/min at one hour. The mean Pulse rate in group BC was comparatively lower when compared to group B which was statistically significant (p<0.05). None of the patients developed bradycardia. None of the patients in both the groups developed any complications.

DISCUSSION

The demonstration of α2 receptors in the peripheral nervous system prompted recent investigations on the use of α2 receptor agonist, clonidine either alone or combined with local anaesthetic for brachial plexus block. Several studies have shown that the addition of α2agonist,clonidine with bupivacaine produces a longer duration of post op analgesia.

The **mean age** (in yrs) of the patients in group B was 32.50±12.89 and group BC was 32.05±11.26 . The mean age of both the groups were comparable. Male to female percentage in group B was 66.66/33.33 and group BC was also 66.66/33.33 which were comparable.

The **mean weight** (in kg) of the patients in group B was 58.93 ±5.21 and group BC was 58.23±4.77 which were both comparable.

Duration of surgery in group B was 92.50±12.78 and group BC was 95.16±11.48 respectively, thus demographically both groups were comparable.

DOSAGE OF ALPHA AGONIST:

In the study of **Eled jam**³⁸ clonidine 150µg was added to 40ml of 0.25% bupivacaine to find the efficacy of agonist on brachial plexus lock. So in our study clonidine 150µg was added to 0.25% bupivacaine.

ONSET OF SENSORY BLOCK:

onset of sensory block in group B was 17.70±1.08 min, group BC was 14.76 ± 1.10 min. Onset of complete sensory block in group BC was significantly reduced(p<0.05) when compared to group B. This reduction in onset time of complete sensory block in our study correlates with the study done by **Eledjam et al(1991)**³⁸(13.0±1.4min).

ONSET OF MOTOR BLOCK :

Onset of motor block in group B was 22.03±1.49min,and group BC was 17.50±0.86 min .Onset time of complete motor block in group BC was significantly reduced(p<0.05) when compared to group B. This correlates with the study done by **Eledjam et al(1991)**³⁸(17.9±2.8 min)

DURATION OF SENSORY BLOCK:

Duration of sensory block in group B was 243.67±12.21min, group BC was 898.65±19.04 min . Duration of sensory block in group BC was statistically significant (p<0.05) when compared to group B. This corroborates with the study done by **Jean Marc Bernard**⁴¹and ²(940±21.5 min) and **Jean Eledjam et al** (994.2±34.2mins) but **JeanMarcBernard** used local anaesthetic lignocaine(400±10.2min).

DURATION OF MOTOR BLOCK:

Duration of motor block in group B was 196.16±09.53min, group BC 820.66±13.11min.Duration of motor block in group BC was statistically significant (p<0.05).This corroborates with study done by **Giovanni et al(2007)**⁴² (845±15.6min)

HAEMODYNAMIC PARAMETERS

In this study there was no significant change in the haemo dynamic parameters from the baseline in both the groups .This was consistent with the observation by **EL Saied AH etal**²⁸ . **Eledjam JJ etal**²⁸ and **Casati A et al**²⁶.

In the study of 28 adult chronic renal failure patients by **Adnan T et**

al²⁹ addition of clonidine in brachial plexus block decreases both heart rate and blood pressure.

SIDE EFFECTS

None of the patients in the two groups showed any of the side effects like bradycardia, hypotension, sedation, dry mouth, dizziness, arrhythmias and local anaesthetic toxicity.

In the study by **Eledjam JJ** and Colleagues³⁸ in 1991 none of the patients reported clonidine related side effects. In another study performed by **Casati A** in 2001²⁶, no significant clonidine related side effects like sedation or haemodynamic instability when added to the local anaesthetic was observed. This was consistent with the observation by **EL Saied AH** and colleagues²⁸.

On evaluating the effect of adding alpha adrenergic agonist clonidine to bupivacaine it was found that clonidine Reduced onset of sensory & motor block ,prolongs the duration of both the sensory & motor block. Does not cause significant haemodynamic changes, sedation or other adverse effects.

CONCLUSION

We conclude that addition of 150 mcg of clonidine to 0.25% bupivacaine accelerates the onset of motor and sensory block, prolongs analgesia without any adverse effect in brachial plexus block for upper limb surgeries.

REFERENCES

1. Ronald D. Miller, Pharmacology of Local Anaesthetics 2005: 6(1): 579-582.
2. Eisenach JC et al, Alpha 2-Adrenergic agonists for Regional anaesthesia. A clinical review of clonidine Anaesthesiology. 1996; 85: 655-674.
3. Gabries JS and Gordin V. Alpha 2 agonists in regional anaesthesia and analgesia current opinion Anaesthesiol 2001: 14: 751-3.
4. John E. Tetzlaff. Peripheral nerve blocks. Morgan Clinical anaesthesiology 2006:4: 329-337.
5. Eisenach et al. Alpha 2 adrenergic agonists for Regional anaesthesia. A clinical review of clonidine (1984-1995). Anaesthesiology 1996: 85: 655-674.
6. Pharmacology and therapeutic significance-Langer of alpha adrenoreceptor subtypes. J cardiovascular Pharmacol 1985: 7 (SUPPL 8) S1-8.
7. Casati A et al 2001. Improving postoperative analgesia after axillary brachial plexus anaesthesia with 0.75% ropivacaine. A double blinded evaluation of adding clonidine. Minerva Anaesthesiol 2001 May; 67 (5): 407-12.
8. El Saied AH Steyn MP. Ansermino JM, CJA 2000. Oct clonidine prolongs the effect of ropivacaine for axillary brachial plexus blockade. CJA 2000 Oct; 47 (10): 962-7.
9. Hutschala et al in 2004 conducted a study using clonidine added to bupivacaine enhances and prolongs analgesia after brachial plexus block via a local mechanism ,in healthy volunteers. European Journal of Anaesthesiology 2004; 21: 198-204.
10. Clonidine as an adjuvant to local anaesthetic axillary brachial plexus block a randomized controlled study by Duma et al BJA 2005: 94: 112-16.
11. Eledjam JJ et al. Brachial plexus block with bupivacaine; effects of added alpha adrenergic agonists: comparison between clonidine and epinephrine. CJA 1991; 38(7); 870-5.
12. Jean m. Bernard and Philip Macaire; dose range effects of clonidine added to lignocaine for brachial plexus block Anaesthesiology 1997:87;277-284.
13. Arjunan Ganesh and Giovanni Cucchiari. The effects of adding clonidine on postoperative analgesia after peripheral nerve blockade. Anaesth Analg 2007;104:532-537.