Original Research Paper

Volume - 10 | Issue - 10 | October - 2020 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Anesthesiology

COMPARATIVE EVALUATION OF INJ. BUPIVACAINE (0.5%) 25 ML + INJ. CLONIDINE (30 MICROGRAM) 0.2 ML AND INJ. BUPIVACAINE (0.5%) 25 ML + INJ. NORMAL SALINE (0.2 ML) IN SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK FOR UPPER LIMB SURGERY.

Divyalekshmi D* Resident Doctor, Department of Anesthesia, Shri M. P. Shah Government Medical College, Guru Gobind Singh Hospital, Jamnagar,Gujarat,India.*Corresponding Author

Dipak L Raval Additional Professor, Department of Anesthesia, Shri M. P. Shah Government Medical College, Guru Gobind Singh Hospital, Jamnagar, Gujarat, India.

ABSTRACT **Background and Aims:** The benefit of post-operative analgesia in regional block is short lived due to limited duration of the action of local anesthetics. Various adjuvants have been tried to enhance the duration of analgesia. This prospective, randomized, comparative, clinical study was designed to evaluate efficacy of Clonidine v/s Normal saline as an adjuvant to Bupivacaine in supraclavicular brachial plexus block for upper limb surgeries.

Material and Method: The patients were randomly allocated into two groups of 30 each to receive either 25 ml of 0.5% Bupivacaine with 0.2 ml of normal saline (Group B) or 25 ml of 0.5% Bupivacaine with 0.2 ml (30microgram) of Clonidine (Group BC). The onset and duration of sensory and motor block, duration of analgesia, and side effects were noted .

Results: The mean onset time for a complete sensory and motor block in Group BC was shorter (12.9min ± 1.29 min; 15.4 ± 1.45 min) as compare to Group B (17.33 ± 1.49 min; 21.33 ± 1.75 min). The mean duration of sensory and motor block in Group BC was longer (682.33 ± 18.5 min; 612.33 ± 28.84 min) as compare to Group B (349 ±25.91 min; 288.66 ± 26.35 min). The mean duration of analgesia in Group BC was 767.66 ± 28 min and in Group B was 386 ± 30.69 min. All results were statistically significant ($P < 0.001$). No significant side effects were observed in any of the two groups ($P > 0.05$).

Conclusion: Clonidine as an adjuvant to Bupivacaine in the supraclavicular brachial block significantly shortens the onset time for sensory and motor block and prolongs the duration of sensory and motor blocks with longer duration of post-operative analgesia.

KEYWORDS : Analgesia, Clonidine,Bupivacaine, Supraclavicular brachial plexus

INTRODUCTION

Regional anesthesia is particularly indicated for patients undergoing peripheral limb surgery because it provides effective intraoperative anesthesia and post-operative pain control. Brachial plexus block is a versatile and reliable regional anesthetic technique and a suitable alternative to general anesthesia for upper limb surgical procedures. Supraclavicular approach of brachial plexus block is the most commonly used approach and provides the most complete and reliable anesthesia for upper limb surgery[1,2]. For brachial plexus block, a drug that has a fast onset, long duration, and minimal toxicity could be an advantage. The quest for safer local anesthetics began toward the end of the 19th century.Bupivacaine is a synthetic amide local anaesthetic drug which reversibly blocks nerve conduction beyond the point of application, when applied locally in the appropriate concentration. It is a racemic mixture of stereoisomers. Local anesthetics alone for supraclavicular brachial plexus block provide good operative conditions but have a shorter duration of post-operative analgesia. Hence, various drugs such as opioids, clonidine, dexamethasone, midazolam ,and magnesium were used as an adjuvant with local anesthetics in brachial plexus block

CLONIDINE is mixed alpha-1 and alpha-2 adreno-receptor agonist with predominant alpha-2 action. It causes decrease in sympathetic nervous system outflow from central nervous system to peripheral tissues. Along with this it is having properties of analgesic effects, sedative and thermoregulatory effects**[3]**.

The aim of our study was to assess the characteristics of supraclavicular brachial plexus block using 0.5% bupivacaine and to study the effect of clonidine as an adjuvant

METHOD AND MATERIAL

After approval of the institutional ethical committee, this prospective, double-blind, randomized trial was conducted on 60 patients of the American Society of Anesthesiologists physical Status I and II of both genders, aged 18–60 years, scheduled for various upper limb surgeries after obtaining written informed consent from each patient. Patients who had not given consent, patients with coagulopathy, infection at the site of block, preexisting peripheral neuromuscular disease, and allergy to any of the study drugs, i.e., clonidine or bupivacaine ,pregnancy, h/o psychiatric or cardiovascular disease were excluded from the study.

The patients were randomly allocated into two groups of 30 each using computer-generated table of random numbers. The allocation concealment was done using sequentially numbered closed opaque-sealed envelope technique. Group B received 25 ml of 0.5% bupicaine with 0.2ml of normal saline and Group BC received 25 ml of 0.5% bupivacaine with 0.2ml (30 microgram) of clonidine. A resident anesthesiologist, who was not involved in the study process, prepared the syringes loaded with the study drugs for supraclavicular block and the another anesthesiologist who performed the block and observed the patient thereafter was unaware of the contents of the loaded syringes for the purpose of double blinding so both the anesthesiologists who prepared the drugs and the observer who performed the block as well as assessed the results, were blinded.

Pre-anesthetic assessment was done on evening before surgery. A routine examination was done by assessing general condition, nutritional status, weight, airway assessment, complete examination of cardiovascular, respiratory system, site of block, and investigation in all patients. All patients were kept electively nil per oral 6 h before surgery and before operation patients were explained about the procedure and a written informed consent taken. Intravenous line secured with 18G intravenous catheter and 500ml DNS was started. Standard monitors such as electrocardiogram, pulse oximeter, and blood pressure cuff were applied, and patient's baseline parameter such as pulse, blood pressure, respiratory rate, and SpO2 was recorded. All patients were premedicated with (on operation table):

Injection glycopyrrolate 0.2mg intravenous
Injection ondansetron 4mg intravenous
Injection midazolam 1mg intravenous.

For performing brachial plexus blockade through supraclavicular approach, we used classical technique[4]. The patients were placed in the dorsal recumbent position with the head turned away from the site of brachial block, under all aseptic and antiseptic precautions midclavicular point, external jugular vein, and subclavian artery pulsation were identified. About 1 cm above the midclavicular point just lateral to subclavian artery pulsation, a 23G 1.5 inch needle was introduced and directed caudal, downward, and medially toward the first rib until paresthesia was noted along radial and ulnar distribution or motor response was elicited. Here, local anesthetic solution is injected. Before every incremental dose, negative aspiration for blood was performed to avoid any intravascular injection.

End of the injection was taken as time "0."
Immediately after the block, sensory and motor characteristics of blockade, hemodynamic variables, and SpO2 were assessed at 1, 3, 5, 10, 15, and 30 min and then at hourly interval till offset of sensory and motor blockade and then at 2 hourly interval for 24 h.

Sensory block was assessed by pinprick test using a needle at each minute after the completion of drug injection in the corresponding dermatomal areas till complete blockade.

The sensory and motor characteristics of the blockade were assessed as per the criteria mentioned below:

SENSORY CHARACTERISTICS

- Onset – is taken as time duration from end of injection to dull response to pin prick at median, radial, ulnar nerve distribution.
- Duration – is taken as time duration from complete block to feeling of pin prick sensation at median, radial, ulnar nerve distribution.

MOTOR CHARACTERISTICS

- Onset – is taken as time duration from end of injection to decreased thumb & shoulder movement.
- Duration – is taken as time duration from complete block to reappearance of thumb & shoulder movement.

Duration of post-operative analgesia was taken as time duration from the onset of sensory block to first rescue analgesic requested by the patient at visual analog scale (VAS) ≥4.

If the block was considered to be adequate, surgeons were allowed to apply tourniquet and start the surgery. If the block was considered to be inadequate for surgery, the patient was given general anesthesia and excluded from the study.

Patients were monitored for nausea, vomiting, hypersensitivity reaction, any sign of cardiovascular system (CVS) or central nervous system (CNS) toxicity, evidence of pneumothorax, hematoma, and post-block neuropathy during the study.

The patients were educated regarding reporting of pain using VAS which is of 10 points where "0" indicates no pain and "10" indicates worst possible pain.

In post-operative period, when patient complained of pain at operative site, inj. diclofenac sodium 1.5 mg/kg intravenously and the time for rescue analgesia noted (VAS ≥4). Injection tramadol 1 mg/kg intravenously was used as a second analgesic when required.

Both groups were compared for complete onset time and total duration of sensory blockade, complete onset time and total duration of motor blockade, and total duration of analgesia. All the data were filled in proforma and were statistically analyzed by GraphPad instant 3.0 software. Intergroup comparison of the quantitative data among the different groups was done using the unpaired *t*-test and of the qualitative data was done by Chi-square test. Intragroup comparison of the quantitative data was done using unpaired *t*-test where baseline value was used as control. $P < 0.05$ was taken as statistically significant.

OBSERVATION AND RESULTS

As shown in Table 1, demographic data in terms of age, sex, and weight were comparable in both the groups ($P > 0.05$ is not statistically significant). The duration of surgery was also comparable in both groups ($P > 0.05$).On comparing both the groups, Group BC produced statistically significant earlier onset and duration of sensory blockade as compared to Group B ($P < 0.001$) , Group BC produced statistically significantly earlier onset and duration of motor blockade as compared to Group B ($P < 0.001$) , Group BC produced significantly prolonged the duration of analgesia as compared to Group B ($P < 0.001$) [Table 2]

Table – 1 Mean demographic data in Group BC and Group B

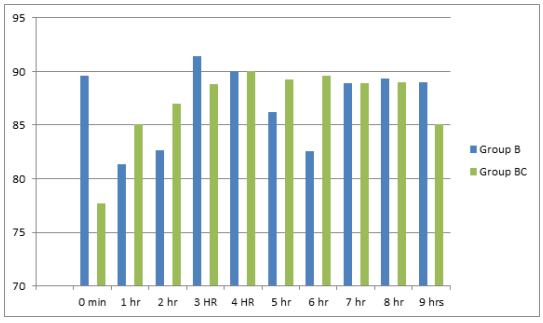
Variable	Study Group				P value
	Group B		Group BC		
	Mean	SD	Mean	SD	
Age (in Years)	35.66	11.33	38.4	11.81	0.364479
Weight (in Kgs)	62.83	8.21	65.16	7.39	0.252276
Gender (M/F)	19/11		17/13		

Table – 2 Mean onset time of complete sensory block in Group B and Group BC

Variable	Time in minutes	Study group				P value (T test)
		Group B		Group BC		
		Mean	SD	Mean	SD	
sensory block	Onset	17.33	1.49	12.9	1.29	<0.001
	Duration	349	25.91	682.33	18.5	<0.001
Motor block	Onset	21.33	1.75	15.4	1.45	<0.001
	Duration	288.66	26.35	612.33	28.84	<0.001
Analgesia	Duration	386	30.69	767.66	28	<0.001

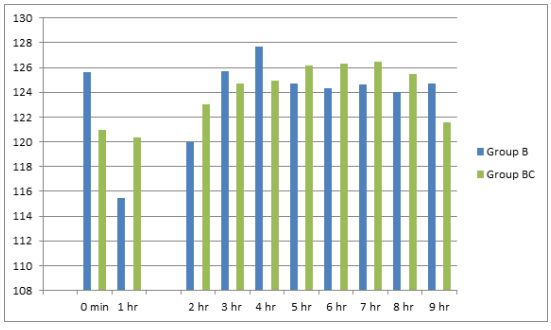
The changes in mean heart rate at different time interval (pre-operative, intra-operative& post operative). After applying T test, the difference was statistically significant most of the time ($p<0.05$) as per shown in figure 1.

Figure- 1: Mean heart rate in Group B and Group BC



The figure 2 shows the changes in mean systolic blood pressure at different time interval (pre-operative, intra-operative& post operative). After applying T test, the difference was statistically significant most of the time ($p<0.05$).

Figure 2:mean systolic blood pressure in Group B and Group BC



The figure 3 shows the changes in mean diastolic blood pressure at different time interval (pre-operative, intra-operative& post operative). After applying T test, the difference was statistically significant most of the time ($p<0.05$).

Figure-3:mean diastolic blood pressure in Group B and Group BC

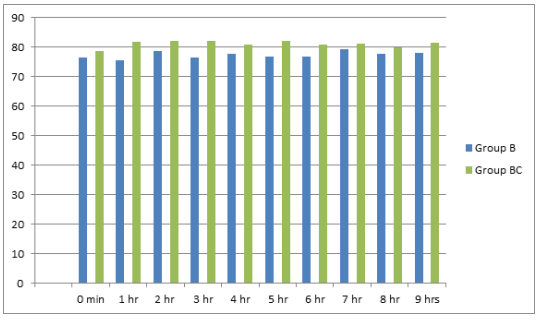


Figure-4: Comparison of sedation score in group BC (no. of patients)

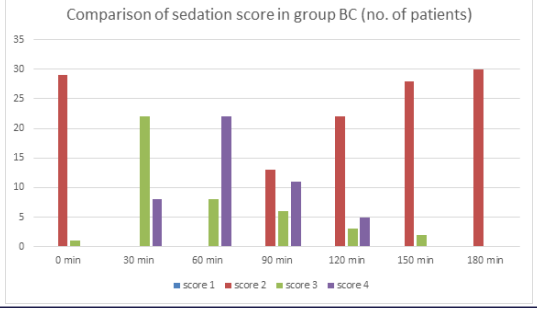
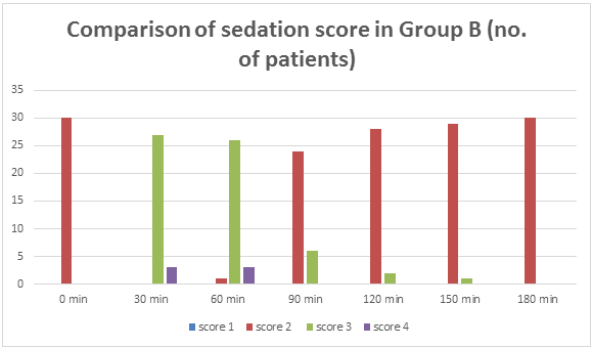


Figure-5: Comparison of sedation score in group B (no. of patients)



As seen by comparing above two charts, it is observed that in group BC sedation score is more than Group B for the most of the time.

Figure-6: Comparison of post operative VAS score in group B (no. of patients)

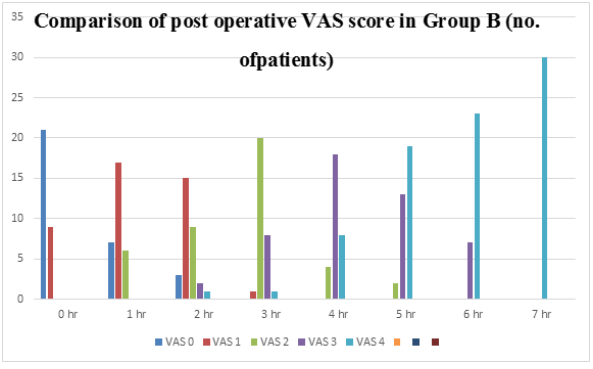
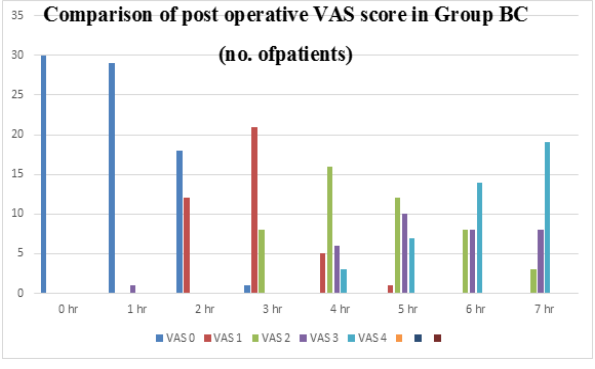


Figure-7: Comparison of post operative VAS score in group BC (no. of patients)



Thus , the post operative VAS score in Group BC was lower than Group B for the most of the time.

DISCUSSION

Regional anesthesia blocks are based on the concept that pain is conveyed by nerve fibers, which are amenable to interruption anywhere along their pathway. Supraclavicular blocks are performed at the level of the brachial plexus trunks. Local anesthetics alone for supraclavicular brachial plexus block provide good operative conditions but have a shorter duration of post-operative analgesia. Recently, clonidine has been reported as an effective adjuvant for regional anesthetic agents. The present study was undertaken to compare analgesia and effectiveness regarding onset and duration of complete motor and a sensory block of 0.5% bupivacaine alone versus 0.5% bupivacaine with clonidine in patients undergoing supraclavicular brachial plexus block.

Onset of sensory and motor block

The mean onset time of complete sensory block in Group B and Group BC was 17.33 ± 1.49 and 12.9 ± 1.29 minutes respectively and complete motor block in Group B and Group BC was 21.33 ± 1.75 and 15.4 ± 1.45 minutes respectively. After applying T test, the difference was statistically **highly significant** ($p<0.001$).

In April, 2010, Susmita Chakraborty, Jayanta Chakrabarti, Mohan Chandra Mandal, Avijit Hazra and Sabyasachi Das**[5]** conducted a study to compare the Effect of clonidine as adjuvant in bupivacaine in supraclavicular brachial plexus block. Group-A received 0.2 ml (30mcg) clonidine and Bupivacaine (0.25%) 25ml. Group-B received 0.2ml Normal Saline and Bupivacaine (0.25%) 25ml. Onset of sensory blockage [group A - 6.2 + 0.78min, group B- 8.7 + 1.01], and onset of motor blockage [group A- 330.4+31.68min, group B - 144.8 + 17.31] and , the difference was statistically significant ($p<0.001$).

In May 2016, Prashant Sirohiya, Kiwi Mantan, H. rehman, Meera Kumari, Vishal Devra, Raghvendra Singh**[6]** conducted a study to compare the Effect of bupivacaine and bupivacaine with clonidine combination in supraclavicular brachial plexus block . Group B (n=30) patients received 25 mL 0.5% Bupivacaine and 0.2 mL of Saline, whereas group C (n = 30) received 25 mL 0.5% bupivacaine and 0.2 mL (30 mcg) clonidine through supraclavicular brachial plexus block. Time of onset of sensory blockade was reduced in group C (4.90 min) compared to Group B (11.67), Time of onset of motor blockade were reduced in group C compared to Group B and were statistically significant.

Duration of Sensory and Motor Blockade

In our study, the mean duration of sensory blockade in Group B and Group BC was 349 ± 25.91 and 682.33 ± 18.5 minutes respectively and mean duration of motor block in Group B and Group BC was 288.66 ± 26.35 and 612.33 ± 28.84 minutes respectively. After applying T test , the difference was statistically **highly significant** ($p<0.001$).

In April, 2010, Susmita Chakraborty et al**[5]** study the duration of sensory blockage in group **A is** 415.4 min and in group B is 194.2 min, duration of motor blockage in group A is 330.4+31.68 and group B is 144.8 + 17.31min .

In May 2016, Prashant Sirohiya Devra et al **[6]** conducted a study, Duration of sensory and motor blockade were prolonged in group C compared to Group B and Duration of motor blockade were prolonged in group C (515.3 min) compared to Group B (307.5 min) were statistically significant.

Duration of analgesia

In our study, the mean duration of analgesia in Group B and Group BC was 386 ± 30.69 and 767.66 ± 28 minutes respectively. After applying T test, the difference was statistically **highly significant** ($p<0.001$).

In April, 2010, Susmita Chakrabortyet al - Analgesia duration was 415.4 min in Group A (Clonidine) compared to 194.2 min in Group B (Control).

In May 2016, Prashant Sirohiya-Duration of post operative analgesia was prolonged in group C compared to Group B and were statistically significant.

Haemodynamic changes

In our study, we have observed statistically significant changes in heart rate, SBP and DBP during the intraoperative and postoperative period. None of our patients required any anticholinergic treatment or any vasopressor support during the study period.

These results are comparable to other studies-

In 2013, Santvana Kohli, Manpreet Kaur, Sangeeta Sahoo, Homay Vajifdar and Pramod Kohli**[7]** conducted a study to compare two different doses of clonidine added to bupivacaine in Brachial plexus block. Thirty patients received 1 g/kg clonidine (group I) and the rest received 2 g/kg clonidine (group II) added to 30 mL of 0.5% bupivacaine through nerve stimulator-guided supraclavicular BPB. Hemodynamics remained comparable in both the groups, incidence of hypotension and bradycardia was higher in group II as compared to group I.

Complication and sideeffects

There was no incidence of headache, nausea, vomiting, hypotension, bradycardia, chest pain, coughing, convulsion and respiratory depression and procedure related complication. There was no CNS and CVS toxicity seen in either group in our study

CONCLUSION

Clonidine as an adjuvant to Bupivacaine in supraclavicular brachial block for upper limb surgery fastens the onset time for sensory & motor

block and prolongs the duration of sensory & motor blocks with longer duration of postoperative analgesia, causes decrease in need of rescue analgesia in patients with no side effects.

REFERENCES

1. Morgan & Mikhail sclinical anaesthesiology 5th edition section 4ch- 46, peripheral nerve blocks: 981-6.
2. Hirschel G, Anaesthesia of the brachial plexus for the surgeries Of the upper extremity,MedWochenschr 1911;58:1555-6.
3. Maze M, Tranguilli W: α2-Adrenoreceptor agonists: Defining the role in clinical anesthesia. Anesthesiology 1991; 74:581.
4. IanMcConachie, John McGeachie, Janet Barrie. Regional Anaesthetic techniques. In : Thomas EJ Healy, Paul R Knight. Editors. Wylie's – A practice of Anesthesia. 7th Ed. Arnold;2003.
5. Effect of clonidine as adjuvant in bupivacaine-induced supraclavicular brachial plexus block: A randomized controlled trial .Susmita Chakraborty, Jayanta Chakrabarti, Mohan Chandra Mandal, Avijit Hazra, Sabyasachi Das Indian J Pharmacol. 2010 Apr; 42(2): 74–77. doi: 10.4103/0253-7613.64498PMCID: PMC2907018
6. Sirohiya P, Mantan K, Rehman H, Kumari M, Devra V, Singh R. Effect of bupivacaine and bupivacaine-clonidine combination in supraclavicular brachial plexus block – A comparative study. IAIM, 2016; 3(5): 29-37.
7. Kohli S, Kaur M, Sahoo S, Vajifdar H, Kohli P. Brachial plexus block: Comparison of two different doses of clonidine added to bupivacaine. J Anaesthesiol Clin Pharmacol 2013;29:491-5