

A Comparative Study between 0.5% Bupivacaine with Clonidine Additive and 0.5% Bupivacaine Plain for Brachial Plexus Block by Supraclavicular Approach in Upper Limb Surgeries Using Ultrasound Guided Technique

Yadhuraj M.K.¹, Somasekharam P.², Vinay D.M.³, Akhil Rao U.K.⁴

¹Junior Resident ²Professor and HOD ³PG Student ⁴PG Student, Dept. of Anaesthesia, MVJ Medical College and Research Hospital, Hoskote, Karnataka 562114, India.

Abstract

Backgrounds and Objectives: Supraclavicular Brachial plexus block provides safe, effective, low cost anaesthesia with excellent post operative analgesia. The current study was an attempt to compare Bupivacaine 0.5% with Bupivacaine 0.5% plus Clonidine 2mcg/kg in supraclavicular brachial plexus block with respect to Onset time and Duration of Sensory blockade, Duration of Analgesia, Side effects. **Materials and Methods:** Present study was carried out in the Department of Anaesthesiology and critical care, MVJ Medical college and RH, Bangalore from December 2014 to July 2016. Each patient was randomly allocated to one of the two groups of 50 patients each. Bupivacaine Group(A): Receives 30ml Bupivacaine 0.5% and 1ml of normal saline Clonidine Group(B): Receives 30 ml Bupivacaine 0.5% and clonidine 2mcg/kg in 1ml saline. **Parameters:** The effect was studied with respect to Onset time and Duration of Sensory and Motor blockade, Duration of Analgesia and Side-effects. **Results: Onset of Sensory block:** In our study, we observed that onset of sensory block was earlier in Clonidine group (Group B) having a mean value 7.20±1.95 minutes in comparison with Bupivacaine group (Group A) having a mean value of 17.63±3.25 minutes which is statistically significant. **Onset of Motor block:** In our study, we observed that onset of Motor block was earlier in Clonidine group (Group B) having a mean value of 9.87±2.60 minutes in comparison with Bupivacaine group (Group A) having a mean value of 20.57±2.92 minutes which is statistically significant. **Duration of Sensory block:** The Duration of sensory block was 359.00±60.53 minutes with Bupivacaine group (Group A) and 552.67±32.05 minutes with Clonidine group (Group B). The duration of sensory block was longer in Clonidine group compared with Bupivacaine group, which is statistically significant. **Duration of Motor block:** The Duration of Motor block was 390.00±55.52 minutes with Bupivacaine group (Group A) and 597.33±27.91 minutes with Clonidine group (Group B). The duration of Motor block was longer in Clonidine group compared with Bupivacaine group, which is statistically significant. **Duration of Analgesia:** The Duration of Analgesia was minutes with 361.67±59.77 Bupivacaine group (Group A) and 563.67±33.16 minutes with Clonidine group (Group B). The duration of Analgesia was longer in Clonidine group compared with Bupivacaine group, which is statistically significant. Variations in Heart rate, Blood pressure, SpO₂, Respiratory rate were statistically not significant in both the groups. No patient in our study developed any significant side effects. **Conclusion:** Addition of 2mcg/kg of Clonidine to Bupivacaine 0.5% has Early onset of Sensory blockade, Early onset of Motor blockade, Prolonged Duration of Sensory blockade Prolonged Duration of Motor blockade, Prolonged Duration of Analgesia when compared to Bupivacaine 0.5% at equal volumes. Both the groups maintain stable Hemodynamic profile Perioperatively and are devoid of any Side effects at the concentration and volumes used for the study.

Keywords: Bupivacaine; Brachial Plexus Block; Clonidine.

Introduction

Peripheral nerve blockade is now a well-accepted concept for comprehensive anaesthetic care. It has become important in clinical practice because of their role in post operative pain relief, shortening

of patient recovery time & avoiding risks and adverse effects of General anaesthesia. Supraclavicular brachial plexus block is the preferred regional anaesthesia for upper limb surgeries. Here, the brachial plexus is presented most compactly at the proximal division or at the trunk level that provides most reliable anaesthesia

Corresponding Author: Yadhuraj M.K., Junior Resident, Dept. of Anaesthesia, MVJ Medical College and Research Hospital, Hoskote, Karnataka 562114, India.

E-mail: dryadurajgowda@gmail.com

Received on 13.09.2017, Accepted on 25.09.2017

for upper limb surgeries by anaesthetising the middle and lower plexus over 80% of the times (median, radial and ulnar). Local anaesthetics administered as regional nerve blocks provides postoperative pain relief by blocking signal transmission to dorsal horn [1]. Certain drugs may be used as adjuncts to local anaesthetics to lower the dose of each agent, to enhance onset, duration of action and analgesic efficacy. Several studies have demonstrated analgesic effects of "Clonidine", an alpha agonist, in local, spinal and epidural anaesthesia when combined with local anaesthetics. This observation that Clonidine has analgesic effects at spinal level has stimulated research to examine analgesic effects in the periphery [2]. It has direct local 2 action on the nerve itself and facilitation of local anaesthetic action. Also, Clonidine seems to provide analgesic benefit without major adverse effects.

The aim of this study is to evaluate whether additional anesthetic and analgesic effects could be derived from administration of Clonidine, an α -adrenergic agonist, into brachial plexus sheath.

Materials and Methods

Source of Data

Present study entitled 'A comparative study between 0.5% bupivacaine with clonidine and 0.5% bupivacaine for supraclavicular brachial plexus block will be carried out at MVJ Medical college & research hospital, banglore from December 2014 to July 2016.

- *Study Design:* Randomized clinical trial using closed envelope method
- *Sample Size:* 30 subjects in each group
- *Sampling Method:* Simple Random Sampling
- *Statistical Analysis:* Repeated measures of ANOVA for vital events and Student's t-test

	Bupivacaine group	Clonidine group	P value
Sensory onset time(SOT)	17.63±3.25	7.20±1.95	<0.001**
Motor onset time(MOT)	20.57±2.92	9.87±2.60	<0.001**

In Bupivacaine group, the mean onset time of Sensory blockade and Motor blockade was 17.63±3.25 min and 20.57±2.92 min Respectively when compared to Clonidine group having Onset time of sensory blockade and Motor blockade of 7.20±1.95 min and 9.87±2.60 min Respectively.

Inclusion Criteria

1. Patients aged between 18 years and 60 years
2. Under physical status ASA grade 1 and ASA grade 2
3. Weight between 50 kilogram -80 kilogram
4. Scheduled for elective upper limb surgeries

Exclusion Criteria

1. Other than ASA 1 and ASA 2
2. Known allergy to local anaesthetic agents and alpha 2 agonist drugs,
3. Local infection at the site of block
4. Brachial plexus injury
5. History of uncontrolled Diabetes or Hypertension,

Study group: Each patient was randomly allocated to one of the two groups of 50 patients each. Bupivacaine

Group (A): Receives 30ml Bupivacaine 0.5% and 1ml of normal saline Clonidine

Group (B): Receives 30 ml Bupivacaine 0.5% and clonidine 2mcg/kg in 1ml saline.

Results

The present study was conducted on 100 consenting patients aged between 18- 60 years. Bupivacaine group (A) received 30ml of 0.5% Bupivacaine plus 1ml saline. Clonidine group (B) received 30ml of 0.5% Bupivacaine plus 2mcg/kg clonidine in 1ml saline for Brachial plexus block by supraclavicular approach.

Comparison of Study Groups on the Basis of Onset Time of Sensory and Motor Blockade

Comparison of Mean Onset Time between the Groups

Onset time of Sensory and Motor blockade was earlier in Clonidine group when compared with Bupivacaine group.

The p value was <0.001 which is statistically very highly significant.

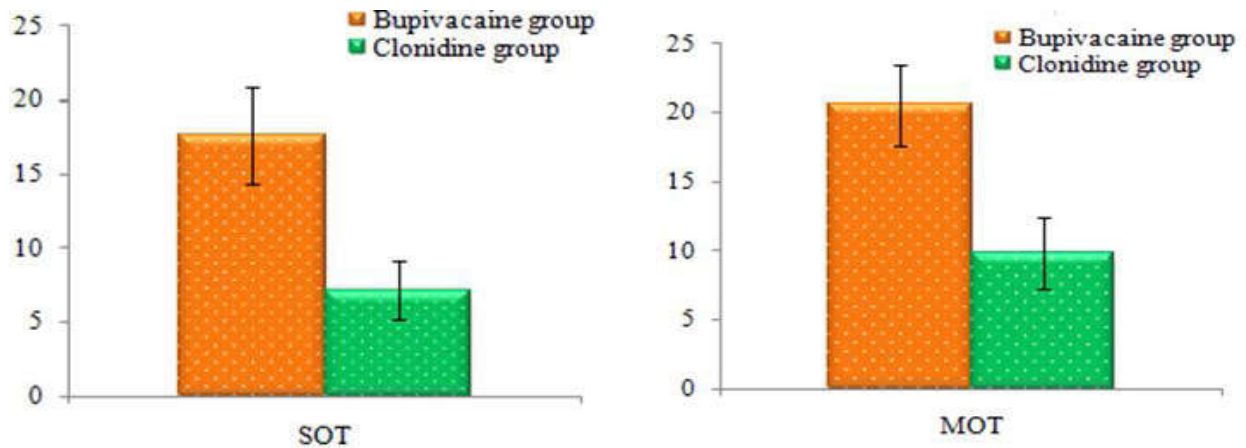


Fig. 1: Onset of sensory and motor block

Table 1: Duration of sensory and motor block

	Bupivacaine group	Clonidine group	P value
Duration of sensory (DOSB)	359.00±60.53	552.67±32.05	<0.001**
Duration of motor block(DOMB)	390.00±55.52	597.33±27.91	<0.001**

In Bupivacaine group, the Mean Duration of Sensory blockade and Motor blockade was 359.00±60.53 min and 390.00±55.52 min Respectively when compared to Clonidine group having Mean Duration of sensory blockade and Motor blockade of 552.67±32.05 min and 597.33±27.91 min Respectively.

Comparison of Mean Duration time of Sensory and Motor Blockade between the Groups

Duration of Sensory and Motor blockade was prolonged in Clonidine group when compared

with Bupivacaine group. The p value was <0.001 which is statistically very highly significant.

In Bupivacaine group, the Mean Duration of Analgesia was 361.67±59.77 min when compared to Clonidine group having Mean Duration of Analgesia of 563.67±33.16 min .

Comparison of Mean Duration time of Analgesia between the groups

Duration of Analgesia was prolonged in Group B when compared with Group R . The p value was <0.001 which is statistically very highly significant.

Table 2: Duration of analgesia

	Bupivacaine group	Clonidine group	P value
Duration of analgesia(DOA)	361.67±59.77	563.67±33.16	<0.001**

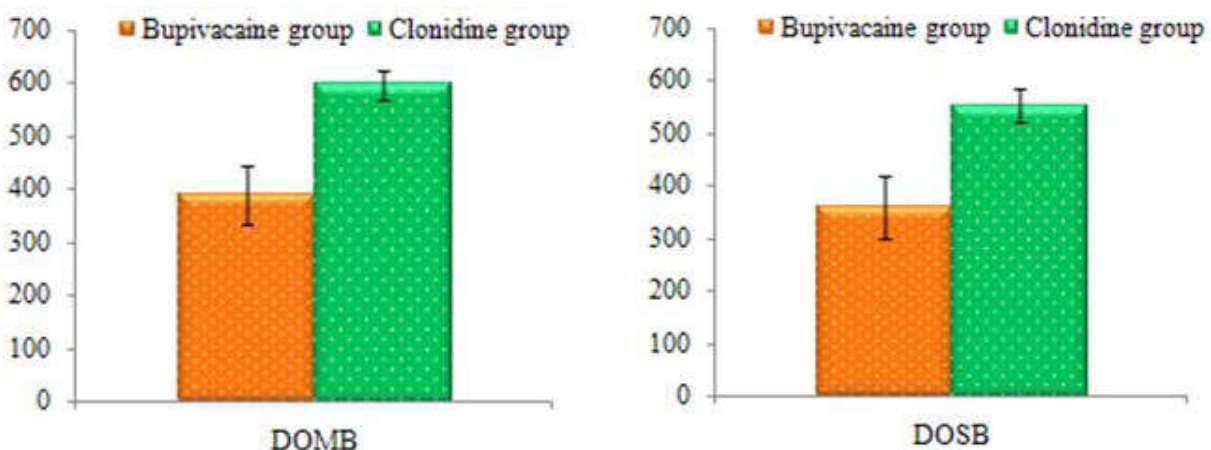


Fig. 2: Duration of sensory and motor blockade in two groups

Table 3: Comparison of side effects

Side effects	Bupivacaine group	Clonidine group
Bradycardia	Nil	Nil
Hypotension	Nil	Nil
Nausea and Vomiting	Nil	Nil

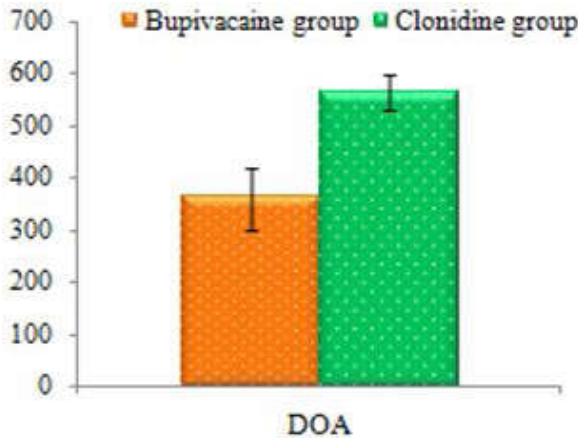


Fig. 3: Comparison of duration of analgesia in two groups

In our study we did not observed any side effects in both the groups

Discussion

A variety of receptors mediate anti-nociception on peripheral sensory axons. The peripheral administration of appropriate drugs (Adjuncts) may have analgesic benefit and reduce systemic adverse effects. In an attempt to improve perioperative analgesia, a variety of adjuncts such as opioids, verapamil, neostigmine and tramadol have been administered concomitantly with local anesthetics into the brachial plexus sheath. The aim of this study was to evaluate whether additional anesthetic and analgesic effects could be derived from administration of Alpha-2 adrenoceptor, Clonidine, into brachial plexus sheath.

Onset of Sensory Block

In our study, we observed that onset of sensory onset was earlier in study group of Clonidine having a mean value of 7.20 ± 1.95 min in comparison with Bupivacaine group having mean value of 17.63 ± 3.25 min, which is statistically significant ($p < 0.001$) This observation well matches with study of Susmitha chakraborty [3], onset of sensory 6.2 ± 0.78 min and 8.7 ± 1.01 min in Clonidine group and control group respectively.

Similar observation was made by Gabriella Iohom [4], where the onset time of sensory block was much faster in Clonidine group, 21.3 ± 7.2 min compared to that of placebo (24.7 ± 5.5 min). A Meta-analysis was conducted by Daniel M. Popping [5] on various studies using Clonidine doses ranging from 90 to 150 μ g in Brachial plexus block. He found early onset of sensory block time with an onset time of Clonidine 12.8 min. In controls, average onset of time of sensory block was 15 min.

Santvana Kohli, Manpreet kaur 2013 conducted a study comparison of two different doses of clonidine added to bupivacaine [6]. They concluded in thier study higher doses of clonidine(2mcg/kg) in brachial plexus block hastens the onset of sensory blocks. Sensory onset of time was 9.9 ± 4.1 min

Onset of Motor Block

In our study, we observed that onset of motor block was earlier in study group of Clonidine having the mean value of 9.87 ± 2.60 min and in comparison, the Bupivacaine group had a mean value of 20.57 ± 2.92 min which is statistically significant ($p < 0.001$).

This observation matches well with the study conducted by Susmitha chakraborty, who had earlier onset of motor blockade in Clonidine group compared to control group, 10.6 ± 1.36 min and 18.1 ± 1.35 min respectively. However, Daniel M. Popping had contrasting result as time for onset of motor block, quantified by using the Bromage scale. In control group mean onset time of motor block was 18.3 min and Clonidine had no significant impact on onset time. Santvana Kohli, Manpreet kaur 2013 conducted a study comparison of two different doses of clonidine added to bupivacaine. They concluded in their study higher doses of clonidine(2mcg/kg) in brachial plexus block hastens the onset of motor blocks. Motor onset of time was 13.2 ± 6.7 min.

Duration of Sensory Block

The duration of sensory blockade, in our study was 552.67 ± 32.05 min with Clonidine group and 359.00 ± 60.53 min for Bupivacaine group, which is statistically significant ($p < 0.001$).

According to Bernard [7] et al in their study Clonidine reduced the use of supplementary intravenous anaesthetic agents for surgery and produced dose dependent prolongation of analgesia, It reached a mean 770 min (range, 190-1440 min) for the largest dose 300µg which matches well with our study. According to Murphy [8] et al, Clonidine provided an analgesic effect that lasted as long as 492 min which is twice the duration of placebo 260 min.

In Daniel M. Popping study, the duration of postoperative analgesia for control group was 461 min where as Clonidine significantly increased the duration to 584 min. Santvana Kohli, Manpreet kaur 2013 conducted a study comparison of two different doses of clonidine added to bupivacaine. They concluded in their study higher doses of clonidine(2mcg/kg) in brachial plexus block prolongs duration of analgesia.

Total duration of analgesia was 21 ± 2.96 h, which is well matched with our study. Our study observations concur well with study conducted by Eledjam [9] et al in supraclavicular block with Clonidine using the dose of 150 µg and 40 ml Bupivacaine of 0.25%. The block produced with the addition of Clonidine was longer (994.2 ± 34.2) compared to epinephrine as adjuvant (control group) 728.3 ± 35.8 . Singh S, Aggarwal A (10)2010 conducted a randomized controlled double – blinded prospective study of the efficacy of clonidine(2mcg/kg) added to bupivacaine (0.25% 40 ml) as compared with bupivacaine alone used in supraclavicular brachial plexus block for upper limb surgeries. They concluded that addition of clonidine bupivacaine hastens onset of sensory and motor block and prolongs duration of sensory block ,motor block and post op analgesia.

During our study we noticed a decrease in systolic, diastolic as well as mean arterial blood pressure and pulse rate but none of the patient had hypotension(defined by decrease in blood pressure by 20%) or bradycardia and maintained the hemodynamic parameters well within the normal range, which is similar to study conducted by Eisenach JC [11] and Culebras et al.

Summary and Conclusion

- Clonidine is an alpha-2 agonist known to prolong the analgesic actions of local anaesthetics by acting on peripheral nerve.
- We studied the anaesthetic and analgesic effects of adding Clonidine into brachial plexus sheath with Bupivacaine solution in 60 patients

undergoing upper extremity orthopaedic, plastic or reconstructive surgery.

- Patients were randomized into 2 groups of 30 each. All patients received brachial plexus block with 30ml of 0.5% Bupivacaine. In addition, group B received Clonidine at the dose of 2 µg/kg and group A received normal saline 1ml added to Bupivacaine solution.
- Onset of sensory blockade was faster in Clonidine group (7.20 ± 1.95 min) compared to Bupivacaine group (17.63 ± 3.25 min), which was statistically significant. Duration of sensory blockade was also longer in Clonidine group (552.67 ± 32.05 min) compared to Bupivacaine group (359.00 ± 60.53 min) and this difference was both clinically and statistically significant ($p=0.001$).
- Onset of motor blockade was faster in Clonidine group (9.87 ± 2.60 min) compared to Bupivacaine group (20.57 ± 2.92 min). The duration of motor blockade was longer in Clonidine group (597.33 ± 27.91 min) compared to Bupivacaine group (390.00 ± 55.52 min) and this difference was both clinically and statistically significant ($p=0.001$). 70
- Also, the time for demand of analgesics was significantly prolonged in Clonidine group (563.67 ± 33.16 min) compared to Bupivacaine group (361.00 ± 59.77 min) this difference was also statistically significant.

References

1. Chad M.Brumett.M.D,Brian A Williams.Additives to local anesthetics for peripheral nerve blockade. *Int Anesthesiol Clin.* 2011 Fall; 49(4):104-106.
2. Damien B. Murphy, Colin J.L et al.Novel analgesics Adjuvants for brachial plexus Block: A systemic Review.*Analgesia and anesthesia* May 2000;90(5): 1122-1128.
3. Susmita Chakraborty. Jayanta Chakraborty, Mohan Chandra Mandal, Avijit Hazra, Sabyasachi Das. Effect of Clonidine as adjuvant in Bupivacaine induced supraclavicular brachial plexus block. A randomized controlled trial. *Indian J Pharmacology.* 2010 Apr;42(2):74-77.
4. Gabriella Iohom, Adnane Machmachi, De'sire'-Pascal Diarra, Mohammed Khatouf, Sylvie Boileau, François Dap, Stéphanie Boini, Paul-Michel Mertes, and Herve Bouaziz, The Effects of Clonidine Added to Mepivacaine for Paronychia Surgery Under Axillary Brachial Plexus Block. *Anesth Analg* 2005;100: 1179-83.

5. Daniel M. Popping, Nadia Elia, Emmanuel Marret, Manuel Wenk, Martin R. Trame'. A Meta-analysis of Randomized Trials. Clonidine as an Adjuvant to Local Anesthetics for Peripheral Nerve and Plexus Blocks. *Anesthesiology*, 2009 Aug;11(2).
 6. Santvana Kohli, Manpreet Kaur. Brachial plexus block: Comparison of two different doses of clonidine added to bupivacaine.
 7. Iskandar H, Benard A, Ruel-Raymond J, Cochard G, Manaud B: The analgesic effect of interscalene block using Clonidine as an analgesic for shoulder arthroscopy. *Anesth Analg* 2003;96:260-2.
 8. Damien B. Murphy, Colin J. L et al. Novel analgesics Adjuvants for brachial plexus Block: A systemic Review. *Analgesia and anesthesia* May 2000;90(5): 1122-1128.
 9. Eledjam JJ, Deschodt J, Viel EJ, et al. Brachial plexus block with Bupivacaine, effects of added alpha-adrenergic agonists: comparison between Clonidine and epinephrine. *Can J Anaesth* 1991;38:870-5.
 10. Singh S, Aggarwal A. A randomized controlled double-blinded prospective study of the efficacy of clonidine added to bupivacaine as compared with bupivacaine alone used in supraclavicular brachial plexus block for upper limb surgeries. *Indian J Anaesthesia* 2010;54:552-7.
 11. Eisenach JC, De Kock M, Klimscha W: Alpha (2)-adrenergic agonists for regional anaesthesia. A clinical review of Clonidine (1984-1995). *Anesthesiology* 1996; 85:655-74.
-