

Original article

Comparative evaluation of two doses of clonidine as adjunct to Ropivacaine in supraclavicular brachial plexus block

¹Dr Rupali Sitaram Patil, ²Dr Smita S.Lele

¹Assistant Professor, Department of Anaesthesia, S.B.H. Government Medical College, Dhule Maharashtra.

² Professor, Site of research: - Department of Anaesthesia

Corresponding author: Dr Rupali Sitaram Patil

Abstract:

Introduction: Peripheral nerve blocks have assumed a prominent role in modern anaesthesia practice as they provide ideal operative conditions without any sedation or systemic haemodynamic effects. It has become an essential and growing part of anaesthesia.

Methodology: After receiving Institutional Ethical Committee approval and written informed consent, 60 ASA I or II adult patients scheduled for upper limb surgeries were included in the study. A thorough preoperative evaluation was performed. The patient was subjected to a complete general and systemic examination and was investigated.

Results: In our study, 60 ASA I and II adult patients of either sex scheduled for upper limb surgeries were included. Two groups were formed of 30 each for the purpose of study which were randomised. The study was a prospective randomised comparative study. **Group K1** received 30 ml of Inj. Ropivacaine hydrochloride 0.5% with addition of Inj. Clonidine hydrochloride 0.5 mcg/kg body weight. **Group K2** received 30ml of Inj. Ropivacaine hydrochloride 0.5% with addition of Inj. Clonidine hydrochloride 1mcg/kg body weight.

Conclusion : Thus to conclude, low doses 0.5 and 1 mcg per kg body weight of Clonidine when added to 0.5% Ropivacaine in supraclavicular brachial plexus block have no statistically significant difference regarding onset and duration of sensorimotor blockade and postoperative analgesia.

Introduction

Peripheral nerve blocks have assumed a prominent role in modern anaesthesia practice as they provide ideal operative conditions without any sedation or systemic haemodynamic effects. It has become an essential and growing part of anaesthesia. It offers an excellent alternative for patients who are haemodynamically compromised or too ill to tolerate general anaesthesia. In addition very good postoperative analgesia can also be provided¹. Orthopaedic and plastic reconstructive surgeries can be of prolonged duration, hence adequate sensory and motor blockade along with profound analgesia are the

main requirements for such surgeries. Due to the nature and site of the surgeries, regional anaesthesia is the anaesthetic technique of choice.

Peripheral nerve blocks are cost effective anaesthetic techniques used to provide anaesthesia and analgesia while avoiding airway instrumentation and haemodynamic consequences of general anaesthesia. Several clinical studies^{3, 4} have shown that Clonidine can prolong the duration of analgesia when used in combination with local anaesthetic agents, including when injected into peripheral nerve sheaths by reducing the time of onset, improving the efficacy of the block during

surgery and extending postoperative analgesia. In a few clinical studies³, a lower dose of Clonidine (0.1 and 0.5mcg/kg) was used as an adjuvant for brachial plexus block. However, till date, there has been no consensus about the ideal dose of Clonidine as an adjunct to LA in the BPB.

Considering the fact that Indian population has relatively lower body weight and that there are few studies with low dose Clonidine, we planned to evaluate two different doses of Clonidine 0.5 and 1 mcg/kg added to Ropivacaine 0.5%, with regard to onset and duration of sensory and motor blockade, hemodynamic variables, postoperative analgesia, and adverse effects.

Aims and objectives

To evaluate two different doses of Clonidine as adjunct to Ropivacaine in supraclavicular brachial plexus block in terms of the following parameters:-

1. Onset of sensory & motor blockade
2. Duration of sensory & motor blockade
3. Duration of analgesia
4. Requirement of post operative analgesia
5. Complications, if any

Materials and methods

Study design and sampling size:

Group K1: Receiving Inj. Ropivacaine hydrochloride 0.5% 30cc + Inj. Clonidine hydrochloride 0.5 mcg/kg body weight.

Group K2: Receiving Inj. Ropivacaine hydrochloride 0.5% 30cc + Inj. Clonidine hydrochloride 1mcg/kg body weight.

Inclusion criteria:

- ASA grade I, II of either sex
- Age between 18 years to 60 years.

Exclusion criteria:

- Patients unwilling to participate in the study.
- ASA grade III, IV.
- Age < 18 yrs & > 60 years
- Existence of peripheral neuropathy.
- Bleeding disorders, oral anticoagulant, antiplatelet agent.
- Local cutaneous infection.
- Patients with hypersensitivity to either of the drugs used in the study.

Methodology

After receiving Institutional Ethical Committee approval and written informed consent, 60 ASA I or II adult patients scheduled for upper limb surgeries were included in the study. A thorough preoperative evaluation was performed. The patient was subjected to a complete general and systemic examination and was investigated as follows:

Investigations -

- Haemoglobin, Complete blood count
- Bleeding time, clotting time
- Chest Xray, ECG, RFT, LFT

After the patient was taken on OT table, patient was monitored using pulse oximeter, cardioscope and noninvasive blood pressure monitor. An intravenous access was secured using an in-dwelling cannula of appropriate size. Patient was premedicated with inj. Glycopyrrolate 0.004 mg/kg body weight. Oxygen supplementation was given using nasal cannula at 2litres/min. Brachial plexus block was performed by supraclavicular approach. Patient was positioned supine with head turned about 30 degree to contralateral side. After palpating the interscalene groove and having it to the most inferior point, which is just posterior

to the subclavian arterial pulse, the latter can be felt in the plane just medial to the midpoint of the clavicle. A 22G, 50 mm stimuplex needle with the nerve stimulator was directed just above and posterior to the subclavian arterial pulse and directed caudally at a very flat angle against the skin. The needle was advanced until the flexion of finger was noted. If contraction was still observed with the intensity of stimulating current decreased to 0.5mA, then following protocol was followed:

Group K1 received 30 cc of 0.5% Inj. Ropivacaine hydrochloride+ Inj. Clonidine hydrochloride 0.5mcg/kg body weight.

Group K2 received 30 cc of 0.5% Inj. Ropivacaine hydrochloride + Inj. Clonidine hydrochloride 1mcg/kg body weight.

If the rib was encountered without paraesthesia or if blood was encountered, the needle was withdrawn and the landmarks as well as the plane of needle insertion path were re-evaluated. Patients were evaluated to determine the loss of arm abduction (deltoid sign as sign of successive motor blockade). Sensory block was assessed by pin prick over the surgical site.

Sensory block:

Onset of Sensory block was defined as time elapsed from injection of drug to complete loss of perception of upper limb elicited by using pin prick.

Quality of sensory block was graded by *Hollmenscale*

Motor block:

Onset of Motor block was defined as time elapsed from injection of drug to complete motor block elicited by asking the patient to abduct the arm, flex the forearm and hand against gravity.

Monitoring:

Statistical analysis:

- An unpaired 't' test was used to compare the demographic variables.
- Intra operative haemodynamic variables between the 2 groups were compared by using unpaired 't' test.
- Onset and duration of sensory and motor block was compared by using unpaired 't' test.
- Sedation scores and pain scores by VAS were compared by using Mann whitney test.
- Rescue analgesic requirement was compared by unpaired 't' test.

A 'p' value <0. 05 was considered as statistically significant.

Discussion

Peripheral nerve blocks are cost effective anaesthetic techniques used to provide anaesthesia and analgesia while avoiding airway instrumentation and haemodynamic consequences of general anaesthesia.

The role of Clonidine as an adjuvant to LA in upper limb peripheral nerve blocks has been extensively studied.^{5, 6, 16} Dose range of 30-300 mcg has been used in various studies^{5,6,9,10} with up to 150 mcg doses being associated with minimal side effects.⁶ But some studies have shown that Clonidine even at such high doses can cause significant haemodynamic compromise which challenges its use in peripheral nerve blocks in outpatients⁷. Besides, there is no study suggestive of any appropriate dose of Clonidine according to weight/kg. In a few clinical studies, a lower dose of Clonidine (0.1-0.5mcg/kg) was used as adjuvants for brachial plexuses block^{3,14}.

Only few studies⁹ are available regarding use of Ropivacaine with adjuvant Clonidine for

modification of block but with equivocal results.

However, till date there has been no consensus about the ideal dose of Clonidine for this purpose. Considering the fact that Indian population has relatively lower body weight and that there are only few studies with low dose Clonidine as an adjuvant with Ropivacaine, we compared the effect of Clonidine 0.5 mcg/kg versus 1 mcg/kg as adjuvant to Ropivacaine for brachial plexus block, by supraclavicular approach.

This study was carried out to evaluate two doses of Clonidine, 0.5 mcg/kg and 1 mcg/kg, added to 0.5% Ropivacaine, with regard to onset and duration of sensorimotor blockade, haemodynamic effects, postoperative analgesia, and adverse effects.

In our study, 60 ASA I and II adult patients of either sex scheduled for upper limb surgeries were included. Two groups were formed of 30 each for the purpose of study which were randomised. The study was a prospective randomised comparative study.

Group K1 received 30 ml of Inj. Ropivacaine hydrochloride 0.5% with addition of Inj. Clonidine hydrochloride 0.5 mcg/kg body weight. **Group K2** received 30ml of Inj. Ropivacaine hydrochloride 0.5% with addition of Inj. Clonidine hydrochloride 1mcg/kg body weight.

Classical approach technique of supraclavicular brachial plexus block with the aid of a nerve stimulator was used.

The **duration of surgery** was also comparable with mean duration of surgery being 2.13 ± 0.72 hrs in group K1 and 2 ± 0.54 hrs in group K2 which was statistically not significant ($p=0.420$) (Table no. 3).

We found that the **onset of sensory and motor blockade** (Table no. 4) was comparable using the unpaired t test ($p > 0.05$) in both the groups. The mean onset of sensory blockade in group K1 was 9.47 ± 1.63 minutes as against 10 ± 1.58 minutes in group K2 ($p=0.2033$). The mean onset of motor blockade in group K1 was 14.70 ± 2.42 minutes as against 14.63 ± 2.39 minutes in group K2 ($p=0.9149$).

Similar results were observed by various studies. **El Saied A.H et al**⁹ Eledjamet al⁶, Gaumannet al.¹⁶, Singelynet al³, Murphy et al.⁵, Erlacher et al.¹², and Hutschalaet al, have also reported that Clonidine did not hasten the onset of block irrespective of the dosage used. In our study, we found that the **duration of sensory blockade and motor blockade** was comparable in both groups (Table 5). T. Confirmatory evidence obtained from previous studies demonstrated that adding Clonidine to LA for brachial plexus block results in a significant increase in duration of both sensory and motor blockade as compared to placebo.^{4,6,7,9}

In a dose finding study evaluating the minimum effective dose of Clonidine required to prolong duration of anaesthesia after axillary brachial plexus block, **Singelyn et al**³ found that there was an increase in mean duration with dose until the 0.4 mcg/kg level (linear trend $P = 0.053$), the dose of Clonidine leading to the first significant linear trend was 0.5 mcg/kg ($P = 0.003$). The linear trend in duration of anaesthesia at doses of 0.5, 1, and 1.5 mcg/kg was not significant ($P = 0.61$), indicating no more increase in duration of anaesthesia with increasing dose. The results of this study showed that the minimum dose of Clonidine required to significantly prolong the duration of analgesia and anaesthesia after axillary brachial

plexus block with 1% Mepivacaine with epinephrine is, respectively, 0.1 and 0.5 mcg/kg. If both durations must be prolonged, 0.5 mcg/kg Clonidine must be the recommended dose.

The time between the supraclavicular block administration and onset of pain (i.e. VAS >4) requiring the administration of a **rescue analgesic**, was measured as the duration of analgesia. Injection diclofenac 75 mg (IV) was given if the VAS was >4. The time for first rescue analgesia was in 13.32hrs±1.47hrs group K1 which is comparable to group K2 (13.4±1.28hrs) and difference was statistically insignificant (p=0.81) (Table 9).

Shivinder Singh et al¹⁵ also found an enhancement of perioperative analgesia and prolongation of recovery of sensation in the Clonidine group, well beyond the pharmacological effect of either Clonidine or Bupivacaine.

In our study, intra operative (Table no.6-8) and post operative (Table no.10-12) **haemodynamic parameters** were also studied. The pulse rate, systolic blood pressure, diastolic blood pressure and oxygen saturation were comparable in both the groups intra operatively and post operatively (p<0.05).

Stable haemodynamics was also reported by Singelynet al.³, Bernard et al.⁴, El Saied et al.⁹, Murphy et al.⁵, Erlacheret al.¹², Duma et al.¹⁰, and Lohomet al.¹¹, while using Clonidine in BPB. **Susmita Chakraborty et al¹⁴** found that there was no statistically significant difference observed in heart rate, blood pressure, and oxygen saturation between the two groups at any time point.

The patients did not receive any sedation before administration of the block. In our study, comparison of **sedation scores** between the

groups was done by applying unpaired 't' test. No statistically significant difference was found (Table 13) (p >0.05). Various studies found similar results.^{3/6/8/11/15}.

The patients were monitored postoperatively for any Clonidine related **side effects** namely respiratory depression, bradycardia, hypotension, excessive sedation, confusion, amnesia etc. No complications were noted. There were no neurological side effects either.

Gaumann et al.¹⁶ concluded that local anaesthetic effects of Clonidine might explain the clinical observation that Clonidine prolongs the action of local anaesthetics in peripheral nerve block where it is administered at approximately 1000-fold smaller concentrations than the local anaesthetic. The efficacy of very small doses of Clonidine observed in our study does not contradict this hypothesis. In a dose defining study evaluating the minimum effective dose of Clonidine required to prolong duration of analgesia after the axillary brachial plexus block **Singelynet al³** also suggested that 0.5mcg/kg Clonidine should be used. **Bernard J M and Macarie P⁴** concluded that the best dose to use clinically is between 30 and 90 mcg.

From the results obtained from our study, we have observed that low doses 0.5 and 1 mcg per kg body weight of clonidine when added to 0.5% Ropivacaine in supraclavicular brachial plexus block have no statistically significant difference regarding onset and duration of sensorimotor blockade and postoperative analgesia. There was haemodynamic stability throughout the study and there were no adverse effects associated with the doses of clonidine used in our study.

Conclusion

Thus to conclude, low doses 0.5 and 1 mcg per kg body weight of Clonidine when added to 0.5% Ropivacaine in supraclavicular brachial plexus block have no statistically significant difference regarding onset and duration of

sensorimotor blockade and postoperative analgesia. There was haemodynamic stability throughout the study and there were no adverse effects associated with the doses of Clonidine used in our study.

References:

1. Damien B, Murhy, Collin JL, Cartney, Vincent WS. Novel analgesic adjuvants for brachial plexus block: A Systemic review. *AnesthAnalg* 2000;90:1122-8
2. Abrahams M S, Aziz M F, Fu R F, Horn J L. Ultrasound guidance compared with electrical neurostimulation for peripheral nerve block: A systematic review and metaanalysis of randomized controlled trials. *Br J Anaesth* 2009; 102: 408-17.
3. Singelyn FJ, Gouverneur JM, Robert A. A minimum dose of Clonidine added to mepivacaine prolongs the duration of Anaesthesia and analgesia after axillary brachial plexus block. *AnesthAnalg*. 1996;83: 1046-1050.
4. Bernard JM and Macarie P. Dose range effects of Clonidine added to Lidocaine for brachial plexus block. *Anesthesiology* 1997;87:277-84
5. Murphy DB, McCartney CJ, Chan VW. Novel analgesic adjuncts for brachial plexus block: A systematic review. *AnesthAnalg* 2000;90:1122-.
6. Eledjam JJ, Viel EJ, Charavel P, Cailar J. Brachial plexus block with Bupivacaine: effect of added alpha adrenergic agonist: Comparison between Clonidine and epinephrine *Can J Anaesth*. 1991;38(7):870-87
7. Buttner J, Ott B, Klose R. The effect of adding Clonidine to mepivacaine. Axillary brachial plexus blockade. *Anaesthetist* 1992;41:548-54
8. Casati A, Magistris L, Fanelli G, Beccaria P, Cappleri G, Aldegheri G et al. Small-dose Clonidine prolongs postoperative analgesia after sciatic-femoral nerve block with 0.75% Ropivacaine for foot surgery. *AnesthAnalg*. 2000; 91: 388-392.
9. A.H. El Saied et al Clonidine prolongs the effect of Ropivacaine for axillary brachial plexus Blockade *CAN J ANESTH* 2000 / 47: 10 / 962-967
10. Duma A, Urbanek B, Sitzwohl C, Kreiger A, Zimpfer M, Kapral S. Clonidine as an adjuvant to local anaesthetic axillary brachial plexus block: a randomized controlled study. *Br J Anaesth* 2005;94:112-16.
11. Lohom G, Machmachi A, Diarra DP, Khantouf M, Boileau S, Dap F et al. The effects of Clonidine added to mepivacaine for paronychia surgery under axillary brachial plexus block. *AnesthAnalg*. 2005;100:1079-1083
12. Erlacher W, Schuschnig C, Orlicek F, Marhofer P, Koinig H, Kapral S. The effects of Clonidine on Ropivacaine 0.75% in axillary perivascular brachial plexus block. *Acta Anaes Scand* 2000;44(1):53-7.
13. Trivedi V and Patel N. A comparative clinical study of injection Clonidine versus midazolam in supraclavicular brachial plexus block for sedation and postoperative analgesia: a study of 60 cases. *J Indian Med Assoc*. 2010;108(9):563-7.
14. Chakraborty S, Chakrabarti J, Mandal MC, Hazra A, Das S. Effect of Clonidine as adjuvant in Bupivacaine-induced supraclavicular brachial plexus block: A randomized controlled trial. *Indian J Pharmacol*. 2010;42(2):74-77.

15. 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 Anaesth* 2010;54(6):552-557
16. Gaumann D, Forster A, Griessen M, Habre W, Poinso O, Della Santa D. Comparison between Clonidine and epinephrine admixture to Lidocaine in brachial plexus block. *AnesthAnalg* 1992;75:69-74.