Section: Anaesthesiology

Original Research Article

COMPARATIVE STUDY OF BUPIVACAINE ALONE AND BUPIVACAINE WITH CLONIDINE IN AXILLARY BRACHIAL PLEXUS BLOCK

V. Thiruchelvan[1], A. Arun Sundar[2], S. Magesh[3]

[1]Associate Professor, Department of Anaesthesiology, Government Villupuram Medical College & Hospital, Tamilnadu, India
[2]Professor, Department of Anaesthesiology, Government Villupuram Medical College & Hospital, Tamilnadu, India
[3]Assistant Professor, Department of Anaesthesiology, Government Villupuram Medical College & Hospital, Tamilnadu, India

Received : *25/11/2024*
Received in revised form : *24/01/2025*
Accepted : *08/02/2025*

Keywords:
Axillary brachial plexus block, Bupivacaine, Clonidine, Regional anaesthesia.

Corresponding Author:
Dr. S. Magesh,
Email: drvthiru111@gmail.com

DOI: 10.47009/jamp.2025.7.1.133

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (1); 672-675

Abstract

Background: The axillary brachial plexus block is a common regional anaesthesia technique for upper limb surgeries, providing effective analgesia and muscle relaxation. This study was aimed to evaluate the analgesic efficacy of clonidine as an adjuvant to bupivacaine in ABPB for postoperative pain relief in upper limb orthopaedic patients. **Materials and Methods:** This randomised controlled trial included 60 patients undergoing elective forearm and hand orthopaedic surgeries at Villupuram Medical College and Hospital. Patients were assigned to Group BA (20 mL of 0.5% bupivacaine with 1 mL saline) or Group BC (20 mL of 0.5% bupivacaine with clonidine 1 µg/kg in 1 mL saline). After preoperative medications, ultrasound-guided axillary brachial plexus block was performed under strict aseptic precautions, depositing 5 mL of local anaesthetic around each nerve. Sensory and motor block onset, duration, and complications were monitored. **Result:** No significant hemodynamic instability or adverse events were observed in either group, highlighting the safety of clonidine as an adjuvant in axillary brachial plexus block. The mean onset time of sensory block was shorter in Group BC (6.03±0.19min) compared to Group BA (8.07±0.31 min) ($p<0.05$). The duration of sensory block was prolonged in Group BC (381.6±8.9min) compared to Group BA (266±15.08min) ($p<0.05$). The duration of the motor block was longer in Group BC (283.4±9.1min) than in Group BA (184.4±8.03min) ($p<0.05$). Moreover, the time to first rescue analgesia was extended in Group BC (375.8±11.02min) compared to Group BA (233.7±14.5min) ($p<0.05$). **Conclusion:** Clonidine, when used as an adjuvant to Bupivacaine, significantly prolonged the duration of both motor and sensory block and markedly delayed the time to first rescue analgesia.

INTRODUCTION

The brachial plexus block is known as "spinal anaesthesia" of the upper extremity, as the onset of the block, and the density of motor and sensory block is comparable to spinal anaesthesia. Brachial plexus block provides excellent post-op pain relief to the patient, profound muscle relaxation to the surgeon, and the least expensive option for hospital administration. Hence, for all upper limb surgeries, brachial plexus block is ubiquitously practiced. When compared to other approaches to the brachial plexus, such as inter scalene, supraclavicular, and infraclavicular, the axillary plexus block carries the least complication. It is relatively technically much easier to perform.

The amide group local anaesthetics Bupivacaine 0.5% is commonly used for this ABPB.[1] Bupivacaine is longer lasting and provides good muscle relaxation. Adjuvants are commonly used along with Bupivacaine to hasten the onset and density of block and extend the duration of sensory blockade. The commonly used adjuvants are opioids, dexamethasone, and selective α2 adrenergic agonists like clonidine and dexmedetomidine, among others.

Aim

This study was aimed to evaluate the analgesic efficacy of clonidine when used as an adjuvant to Bupivacaine in axillary brachial plexus block (ABPB) for postoperative analgesia in upper limb orthopedic patients.

MATERIALS AND METHODS

This prospective Randomized Controlled Trial included 60 adult patients randomly divided into two

ISSN (O): 2687-5365; ISSN (P): 2753-6556

groups (BA and BC) undergoing forearm and hand elective orthopedic surgeries in the Department of Anaesthesiology at Villupuram Medical College and Hospital, Villupuram. The study was conducted after obtaining approval from the Institutional Ethical Committee, and informed consent was obtained from all patients.

Inclusion Criteria

Patients aged 18 to 60 years, ASA 1 & 11, with expected duration of surgery < 90 minutes, were included.

Exclusion Criteria

Patients who are allergic to local anaesthetics, infection or trauma at the axillary block site, preexisting neurological deficits, coagulopathy, and neuromuscular disorders, and who had not been kept nil per oral (NPO) since 10 PM prior to surgery were excluded.

Methods

Patients were randomly divided into two groups, and an axillary brachial plexus block was performed. Group BA: received 20 ml of 0.5% Bupivacaine and 1 ml of normal saline. Group BC: Received 20 ml 0.5% Bupivacaine with clonidine 1ug/kg in 1 ml normal saline. Computer-generated randomization was used, and both the person administering the block and the person monitoring its effects were blinded to the drug being injected. Tab. Ranitidine 150 mg and Tab. Diazepam 10 mg was given the night before surgery. After attaching standard monitors, the patient was kept supine with the arm abducted to 90 degrees and the forearm at 90-degree flexion to arm [1,2]. Under strict aseptic precaution, a high-frequency linear array probe of Mindray was used to delineate the son anatomy of the brachial plexus.

The linear probe was kept over the biceps and triceps muscle in the axillary area, and the pulsatile axillary artery was identified. Relative to axillary artery, the median nerve was visualized around 9 to 12 O' clock quadrant, the ulnar nerve inferior to the median nerve, around 2 to 3 O' clock quadrant, the radial nerve around 5 to 6 O' clock quadrant and Musculo cutaneous nerve is located in the fascial layer between biceps and coracobrachialis or within either muscle[1]. Under strict aseptic precaution, approximately 5 ml of local anaesthetic mixture was deposited around each nerve after negative aspiration for blood.

The patient was monitored with BP, PR, T, SpO2, and ECG until one hour after the surgical procedure. The patient was monitored for complications like nausea, vomiting, hypotension, bradycardia, respiratory depression and chest pain. The sensory block and motor block were assessed every 2 minutes for an initial 30 minutes and every half an hour until the patient recovered fully from the block. Sensory block was assessed [3] by pinprick in all four Median N, Ulnar N, Radial N and Musculocutaneous nerve area and graded as 0 – normal response, 1 – dull response and 2 – no response to pinprick. The onset time for the sensory blockade was defined as the time interval between the end of the drug injection and the time of no response to the pinprick.

Motor block was assessed based on Bromage scale [4], grade 0 = normal motor function with full flexion and extension of elbow, wrist and fingers. Grade 1 = decreased motor function with finger movement alone; grade 2 = complete motor block with no finger movement. The onset of motor block was defined as the time interval between the end of the drug injection to Bromage scale grade 2. The time to first rescue analgesia was defined as the time interval from the end of the drug injection to the time the patient complained of pain. Once the patient complained of pain, diclofenac 1.5 mg/kg was used as a rescue analgesic.

Statistical analysis

Data were presented as mean, standard deviation, frequency and percentage. Continuable variables were compared using the independent sample t-test. Significance was defined by p-values less than 0.05 using a two-tailed test. Data analysis was performed using IBM-SPSS version 21.0.

RESULTS

The mean time for the onset of sensory block was 8.07±0.31 minutes in Group BA and 6.03± 0.19 minutes in Group BC. This difference was highly significant (p<0.05) [Figure 1].

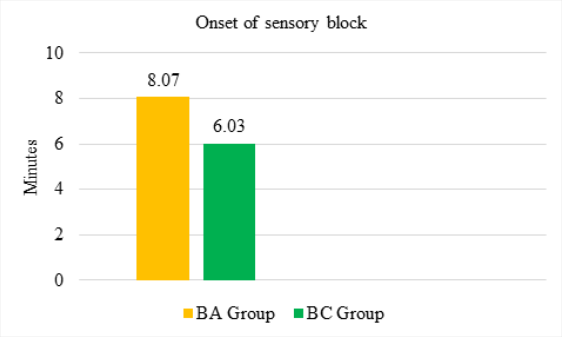

Figure 1: Onset of sensory block

The mean duration of the sensory block was 266±15.08 minutes in Group BA and 381.6±8.9 minutes in Group BC. This difference was highly significant (p<0.05) [Figure 2].

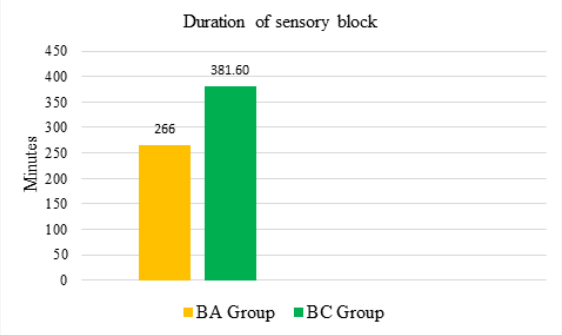

Figure 2: Duration of sensory block

ISSN (O): 2687-5365; ISSN (P): 2753-6556

The mean duration of the motor block was 184.4±8.03 minutes in Group BA and 283.4±9.1 minutes in Group BC. This difference was significant ($p<0.05$) [Figure 3].

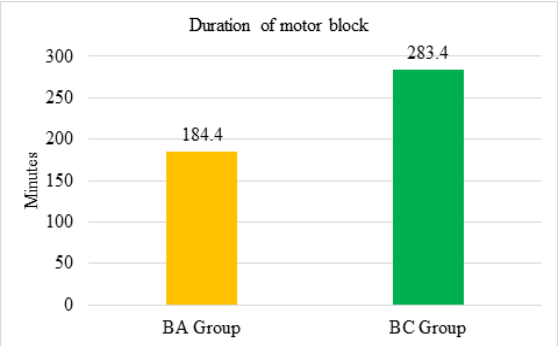

Figure 3: Duration of motor block

The mean time to rescue analgesia was 233.7±14.5 minutes in Group BA and 375.8±11.02 minutes in Group BC. This difference was highly significant ($p<0.05$) [Figure 4].

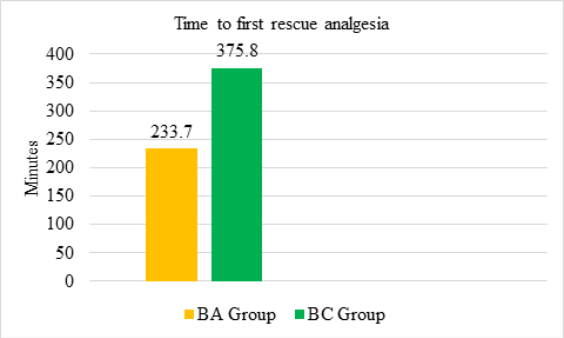

Figure 4: Time to first rescue analgesia

Our study clearly reveals that the addition of clonidine as an adjuvant to bupivacaine accelerates the onset and prolongs the duration of sensory blockade, as well as extends the time to first rescue analgesia. All these findings were highly significant ($p<0.05$). Furthermore, patient vital signs, including BP, PR, RR, T, SpO_2, and sedation level, remained stable in both groups without any significant deviations.

DISCUSSION

Clonidine acts by opening cationic channels and hyperpolarising the neuronal cell membrane, thereby facilitates the sodium channel blocking action of Local Anaesthetics. Many studies have reported that clonidine reduces the block onset time and significantly prolongs the duration of both motor and sensory block. Hence, in this study, we used clonidine at a dose of 1 ug/kg[4] as an adjuvant along with the commonly used Bupivacaine and studied the onset time, block duration and the time to first rescue analgesia.

Axillary brachial plexus block is a favourable technique, for it demands the least expertise and a much more favourable safety profile. There is virtually no phrenic nerve blockade, and it avoids pleural puncture and the risk of pneumothorax. Bupivacaine has a proven safety profile in the recommended dosage, and we selected the dose of 2 mg/kg of 0.5% solution as recommended[1]. However, in the paediatric population, bupivacaine has been used in a concentration of 0.25%.[2]

With the advent of USG, local anaesthetics can be precisely deposited near individual nerve roots. The use of USG can avoid intravascular or intraneural injections, and it has significantly reduced the dose requirement of local anaesthetics since the drug is deposited very close to the neural elements[1]. In one study of the supraclavicular approach to brachial plexus, clonidine significantly prolonged the duration of analgesia even at a dose of 30ug.[5] Lower doses of clonidine have been used spinally with better results.[4] The fastest onset of both motor and sensory action by clonidine in brachial plexus block has been reported in a dose of 1.5 ug/kg.[4] Clonidine has been recommended in the brachial plexus block up to 2 ug/kg,[3,5] as an adjuvant, but we used it in the safe range of 1 ug/kg[4] in the axillary brachial plexus block. Clonidine has been reported to prolong the duration of sensory blockade in supraclavicular brachial plexus block[6] spinally[7,8], epidurally[9] and in axillary block[10]. Many studies have documented the beneficial action of clonidine when administered spinally[11-14] or even systemically[15]

Since we injected the drug at multiple points, it would have hastened the onset of blockade. The use of clonidine has been reported to have produced complications like bradycardia, hypotension and a high level of sedation. In the used dose of 1 ug/kg in axillary brachial plexus block, none of those complications were noticed. In contrast, this is similar to the findings noted in the study by Chakraborty et al,[5] which significantly hastened the onset, prolonged the duration of sensory analgesia, and delayed the time to first rescue analgesia.

CONCLUSION

From our study, we conclude that the addition of clonidine 1ug/kg as an adjuvant to 0.5% Bupivacaine in USG-guided axillary brachial plexus block, significantly hastens the block onset, prolongs the duration of both motor and sensory blockade and delays the time to first rescue analgesia without any clinically significant complications like hypotension, bradycardia or respiratory depression.

REFERENCES

1. Brown's Atlas of Regional Anesthesia, Fifth Edition, Elsevier, Pages 69 -74.
2. Adel Abdelmoneim A, Abdelrasoul Hafez S, Gmail Hanna M, Abdel Kader DS. The motor effects of 0.25% bupivacaine vs 0.19 bupivacaine in ultrasound-guided axillary brachial plexus block in pediatrics undergoing below-elbow orthopedic surgeries: A randomized controlled study. Egypt J Anaesth

ISSN (O): 2687-5365; ISSN (P): 2753-6556

2023; 39:785–93. https://doi.org/10.1080/11101849.2023.2256564.
3. Priyadarshi D, Gondalia D, Parmar V. Comparative study of ropivacaine with clonidine and ropivacaine alone in supraclavicular brachial plexus block. Int J Pharm Sci Res. 2018; 9:2456–62. https://doi.org/10.13040/IJPSR.0975-8232.9(6).2456-62.
4. Kelika P, Arun JM. Evaluation of clonidine as an adjuvant to brachial plexus block and its comparison with tramadol. J Anaesthesiol Clin Pharmacol 2017; 33:197–202. https://doi.org/10.4103/joacp.JOACP_58_13.
5. 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; 42:74–7. https://doi.org/10.4103/0253-7613.64498.
6. Patil KN, Singh ND. Clonidine as an adjuvant to ropivacaine-induced supraclavicular brachial plexus block for upper limb surgeries. J Anaesthesiol Clin Pharmacol 2015; 31:365–9. https://doi.org/10.4103/0970-9185.161674.
7. Sethi BS, Samuel M, Sreevastava D. Efficacy of analgesic effects of low dose intrathecal clonidine as adjuvant to bupivacaine. Indian J Anesth 2007;51. https://journals.lww.com/ijaweb/fulltext/2007/51050/efficacy_of_analgesic_effects_of_low_dose.9.aspx
8. Wahi A, Singh AK, Syal K, Sood A, Pathania J. Comparative efficacy of intrathecal bupivacaine alone and combination of bupivacaine with clonidine in spinal anaesthesia. J Clin Diagn Res 2016;10: UC06-8. https://doi.org/10.7860/JCDR/2016/16343.7565.
9. Singh M, Pathak A, Khan AL, Srivastava A, Negi D. Comparative study of clonidine with ropivacaine versus ropivacaine alone in epidural anesthesia for lower limb orthopedic surgery. Anesth Essays Res 2017; 11:1035–9. https://doi.org/10.4103/aer.AER_67_17.
10. Murphy DB. Noval analgesia adjuncts for brachial plexus block. A systemic review. Anaesth Analg 2000:1122–8. https://doi.org/10.1097/00000539-200005000-00023
11. Singh R, Chopra N, Choubey S, Tripathi RK, Prabhakar, Mishra A. Role of Clonidine as adjuvant to intrathecal bupivacaine in patients undergoing lower abdominal surgery: A randomized control study. Anesth Essays Res 2014; 8:307. https://doi.org/10.4103/0259-1162.143119.
12. Gentili ME, Mamelle JC, Le Foll G. Combination of low-dose bupivacaine and clonidine for unilateral spinal anesthesia in arthroscopic knee surgery. Reg Anesth 1995; 20:169–70.
13. Sites BD, Beach M, Biggs R, Rohan C, Wiley C, Rassias A, et al. Intrathecal clonidine added to a bupivacaine-morphine spinal anesthetic improves postoperative analgesia for total knee arthroplasty. Anesth Analg 2003:1083–8. https://doi.org/10.1213/01.ane.0000055651.24073.59.
14. Niemi L. Effects of intrathecal clonidine on duration of bupivacaine spinal anaesthesia, haemodynamics, and postoperative analgesia in patients undergoing knee arthroscopy. Acta Anaesthesiol Scand 1994; 38:724–8. https://doi.org/10.1111/j.1399-6576.1994.tb03985.x.
15. Dobrydnjov I, Samarütel J. Enhancement of intrathecal lidocaine by addition of local and systemic clonidine. Acta Anaesthesiol Scand 1999; 43:556–62. https://doi.org/10.1034/j.1399-6576.1999.430512.x.

ISSN (O): 2687-5365; ISSN (P): 2753-6556