Original Research Article

Comparative evaluation of the effects of adjuvant clonidine to bupivacine with solo bupivacine for axillary brachial plexus block

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Received: 08-08-2021 / Revised: 22-09-2021 / Accepted: 13-10-2021

Abstract

Background: Peripheral nerve blockade has become an important and growing part of anesthesia. It offers an excellent substitute for patients who are hemodynamically compromised or too ill to tolerate general anesthesia. However, there is no data available on the effect of clonidine with bupivacaine in axillary plexus block or any peripheral nerve block. **Aim:** Therefore, present study was designed to compare the effects of adjuvant clonidine to bupivacine with solo bupivacine for axillary brachial plexus block. **Materials and Methods:** The present prospective, randomized, controlled, study was conducted in the Department of Anaesthesiology and Intensive Care. Patients were arbitrarily assigned to one of the two groups of 30 patients each. Group I (n=30) Patients received 25 ml of Bupivacaine (0.5%) + 1 ml of normal saline. Whereas, Group II (n =30) Patients received 25 ml of Bupivacaine (0.5%) + 1ml (150µg) clonidine. **Results:** It is evident that onset of motor block was 8.72 minute faster in group I Bupivacaine clonidine patients. Duration of motor block was significantly high in Bupivacaine clonidine group patients (440.4±42.18 min) compare to Bupivacaine group patients (198.33±27.86 min) with p value <0.01. Duration of analgesic effects was significantly high in bupivacaine clonidine patients in comparison of bupivacaine patients (718.6±40.6 min vs 512.8 ± 32.9 min, p<0.01). **Conclusion:** Findings of the current study suggest that use of clonidine as adjuvant to bupivacaine hasten motor and sensory block as well as prolonged duration of analgesic effects in comparison of solo use of bupivacaine without inducing any side effects except some sedation in postoperative period.

Keywords: Axillary brachial plexus, clonidine, bupivacine, duration of analgesia.

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Introduction

Peripheral nerve blockade has become an important and growing part of anesthesia. It offers an excellent substitute for patients who are hemodynamically compromised or too ill to tolerate general anesthesia. In addition very good postoperative analgesia can also be provided.[1,2] Peripheral nerve blocks not only provide intra-operative anaesthesia but also extend analgesia in the post-operative period without any systemic side-effects.[3] The axillary brachial plexus block is among the most popular regional nerve blocks performed for upper limb surgeries like elbow, forearm, wrist and hand surgery.[2]Axillary approach to brachial plexus blockade has the advantage of being performed away from the pleura and neuraxial structures, so it is ideal of obtaining block with a minimum of discomfort, complications and side effects.[4,5] However, there is no data available on the effect of clonidine with bupivacaine in axillary plexus block or any peripheral nerve block. Very few studies have been done to assess the impact of clonidine ajuvant to bupivacaine.[6] Therefore, present study was designed to compare the effects of adjuvant clonidine to bupivacine with solo bupivacine for axillary brachial plexus block.

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Materials and Methods

The present prospective, randomized, controlled, study was conducted in the Department of Anaesthesiology and Intensive Care, of our institute from February 2020 to March 2021 after obtaining approval from the institutional research committee. All participants

gave written informed consent before taking part in the study. Eighty patients, ASA physical status I–III, 18 yr of age or older, undergoing surgery of the forearm or hand, were recruited for the study. Patients for whom axillary brachial plexus block or the study medications were contraindicated, or who had a history of significant neurological, psychiatric, neuromuscular, cardiovascular, pulmonary, renal or hepatic disease, or alcohol or drug abuse, as well as pregnant or lactating women, were excluded from the study. Along with it patients who were taking medications with psychotropic or adrenergic activities, patients receiving chronic analgesic therapy other than simple analgesics were also barred from the study. Appropriate investigations and pre-anesthetic checkup were performed. No premedication or sedation was given. Before the procedure, the linear visual analogue scale on 0-10 cm was explained to the patient for the assessment of pain where zero denotes no pain and ten denotes the worst pain imaginable. Patients were then arbitrarily assigned to one of the two groups of 30 patients each. Randomisation was done by computer- generated numbers.

Group I (n=30) Patients received 25 ml of Bupivacaine (0.5%) + 1 ml of normal saline

Group II (n =30) Patients received 25 ml of Bupivacaine (0.5%) + 1ml (150µg) clonidine.

The block was performed by the anesthesiologist who also records the observations. The study drugs were prepared by a fellow anesthesiologist who was unaware of the study hypothesis.

Methodology

In the operating room, standard monitors were attached an intravenous cannula was inserted into the contralateral arm. Throughout the process, basal heart rate, blood pressure and peripheral arterial oxygen saturation (SpO2) were recorded and checked. By a single injection method using a nerve stimulator, the brachial plexus in the axilla was blocked. The patient was placed in supine position. The arm to be blocked was abducted at 900, with forearm flexed and externally rotated. Under all aseptic conditions, after palpating the axillary artery, a 22 gauge, 5 cm long, short-beveled, Teflon- coated nerve stimulator needle was inserted adjacent and superior to it high in axilla at 30 to 40- degree angle aimed toward the midpoint of the clavicle. Primarily the nerve stimulator was set to a pulse duration of 0.15 ms, the current intensity of 1 mA & frequency of 2 Hz to localize proximity to plexus by observing the muscle stimulations in the forearm and hand. In addition, the needle was advanced and current intensity decreased until the visible muscle stimulation remained present at 0.5 mA. At this point, whole drug solution was injected as per the group allotment and the needle was detached.A neurovascular sheath was compressed for 5 minutes subsequent to the performance of the block to minimize the distal spread of the drug. The patient's arm was kept elevated on the pillow over the chest for at least thirty minutes prior to the surgery. Sensory block, motor block, and sedation were evaluated every 5 minutes[7].

Sensory block

Sensory block was evaluated every five minutes for thirty minutes on a 3 point scale for pain using pinprick with 25 gauge needle.

1= sharp sensation
2= blunt sensation
3= no sensation

Motor block

Motor block was evaluated every five minutes for thirty minutes by the modified Bromage Scale.

0= no movement,
1= finger movement,
2= flexion of the wrist against gravity,
3= extension of elbow against gravity

Sedation was achieved using four-point scales.

1= awake,
2= drowsy but responsive to a command,
3= very drowsy but responsive to pain,
4= unresponsive

The onset of sensory block was described as a time from injection till disappearance of pain by pinprick test (pinprick=3). The onset of motor block was described as the time between injection and motor paralysis distal to the injection site (modified Bromage Scale=0). Readiness for surgery was described as complete sensory and motor block in a surgical territory (pinprick test=3 and modified Bromage scale =0). Duration of sensory block was described as the duration from onset of sensory block till complete regression of sensory block (pinprick test 3 to 1). Duration of motor block was described as the duration from onset of the motor block until the complete regression of motor block (modified Bromage Scale 0 to 3).In case of pain during surgery, supplementary intravenous analgesia with 1µgkg-1 of fentanyl was given. Further, if the patient still felt pain it was treated as a failed block and general anesthesia was administered. Patients of the failed block were excluded from statistical analysis.At the end of surgery, the patient was transferred to the post-anesthesia care unit for further observation and management. Following the operation, all patients were assessed every fifteen minutes till the complete regression of sensory block, complete regression of motor block. the patient was monitored every fifteen minutes till fully awake. When VAS equals 4, all the patients received injection diclofenac 75 mg intramuscular and time was recorded and the study ended here.

Statistical analysis

The results of the present study were expressed as mean ± SD. Unpaired student t test was used for statistical analysis. SPSS V11 manufactured by USA was used for statistical calculations. The p value <0.05 was considered as statistically significant.

Results

[Table 1] show that there was no significant difference between age, sex, height, weight, BMI and surgery time of all the patients of group I and group II.

Table 1: Baseline characteristics of group I and group II

Baseline characteristics	Bupivacaineclonidine group	Bupivacaine group	P value
Age (Years)	41.18±8.24	40.24±10.46	>0.05
Sex (M/F)	34/16	36/14	>0.05
Height (Cm)	164.6±11.37	163.8±9.76	>0.05
Wight (Kg)	58.4±7.66	57.9±8.83	>0.05
BMI Kg/m2)			
Duration of surgery (Min)	110.4±14.27	115.7±13.56	>0.05

[Table 2] shows the onset and block of motor and sensory nerve. It is evident from table 1 that onset of motor block was 8.72 minute faster in group I bupivacaine clonidine patients. Duration of motor block was significantly high in Bupivacaine clonidine group patients (440.4±42.18 min) compare to Bupivacaine group patients (198.33±27.86 min) with p value <0.01. Further, results revealed that onset of sensory nerves were significantly faster in group I bupivacaine clonidine patients compare to group II bupivacaine patients. Duration of sensory block was significantly prolonged in bupivacaine clonidine patients comparison of bupivacaine patients (339.474+40.92 min Vs 212.73+ 35.15 min, p<0.01).

Table 2: Time profile of motor and sensory blocks in group I and group II

Baseline characteristics	Bupivacaine clonidine group	Bupivacaine group	Duration
Onset of motor block (Min)	10.12±1.26	19.4±1.82	< 0.01
Duration of motor block (Min)	440.4±42.18	198.33±27.86	< 0.01
Onset of sensory block (Min)	5.37±0.82	8.9±0.95	< 0.01
Duration of sensory block (Min)	339.47±40.92	212.73±35.15	< 0.01

The onset of surgical block was significantly faster in group I Bupivacaine clonidine patients (12.6+1.28 min) compare to bupivacaine patients (21.742.46 min). In addition, it is evident from figure 1 that duration of analgesic effects was significantly high in bupivacaine clonidine patients in comparison of bupivacaine patients (718.6+40.6 min vs 512.8 + 32.9 min, p<0.01).

[Table 3] shows that there was no significant difference between heart rate, blood pressure and oxygen saturation of both groups. However, patients of Bupivacaine clonidine group were found more sedative in comparison of bupivacaine group patients.

Table 3: Drug reaction profile in group I and group II

Adverse effects	Bupivacaine clonidine group	Bupivacaine group	Duration
Bradycardia (Heart rate <45 Min)	1	0	>0.05
Hypotension (decrease of mean arterial blood pressure)	10	8	>0.05
Oxygen Saturation < 90 %	0	0	
Sedation Score	2.66±0.89	1.6±0.58	<0.05
Post Operative Weakness	1	0	>0.05

Discussion

Finding of the current study have shown that onset of motor block was significantly faster in Bupivacaine clonidine group I in comparison of bupivacaine group II. These findings are consistent with the earlier studies of Bernard et al[8]and Chakraborty S et al[9] as they recorded significantly faster onset of motor block in Bupivacaine clonidine group compare to bupivacaine group. However, these findings were inconsistent with the findings of Duma et al,[10] as they did not record any significant difference between onsets of motor block in Bupivacaine clonidine group and bupivacaine group.Probable explanation for this inconsistency may relate to inter-patient variations in the anatomy of the plexus sheath and difference in the spread of local anesthetics in the plexus sheath depending upon the block technique. More explanations may be forthcoming when the mechanism of adjuvant action of clonidine in this setting is elucidated. Further, results of the current study showed that duration of motor blockage and analgesic effects were prolonged in Bupivacaine clonidine group compare to bupivacaine group. These results are in consistent with the previous study of Bernard et al,[8]as they observed significantly increased motor block and prolonged anaesthesia by adding more than 30 µg clonidine to bupivacaine for axillary brachial plexus.Moreover, they reported different effects of low doses of clondine adjuvant in nerve blocks via single or multiple injections. Similarly, Chakraborty S et al,[9] recorded significantly prolonged motor block and analgesic effect in Bupivacaine clonidine group in comparison of bupivacaine group. Alike, Singelyn et al. [11] recorded that minimum 0.5 µg/kg of clonidine is required for the longer duration of analgesic effects after axillary brachial plexus block without any significant side effects like bradycardia or hypotension.With regard to prolongation of block, it is interesting to note that clonidine is widely recommended to prolong duration of axillary plexus block[12,13]. Clonidine is considered as sole analgesic but it does not produce clinically relevant analgesia. Studies have suggested that prolonged analgesic effects of clonidine may be due its direct action on nerve fibres and their receptors and axonal ion channels[7,11,14,15]This significant difference in onset and time duration of motor block between two groups may be due to additional use of clondine in group I as previous studies have reported that clonidine may hasten the onset of motor block and increase the duration of motor block. Moreover, it has been recorded in studies that perineural administration clondine is more effective compare to subcutaneous or intramuscular administration.This more effective and prolonged duration of clondine during perineural administration may be due to clondine promptly affects local neurone[15-17]Present study included brachial plexus block technique of local anaesthesia. Local anaesthetic agents spread differently according to various block techniques as well as diverse concentration of clonidine.Numerous studies reported prolonged anaesthetic effects of clondine in axilary brachial plexus[18-20]. Mechanism of action of clondine is still unclear. However studies suggest that synaptic adrenergic receptors are affected via neuroaxial techniqueS[20]. Nevertheless, axial brachial plexus block cannot be compared with epidural or intrathecal techniques.

Conclusion

Findings of the current study suggest that use of clonidine as adjuvant to bupivacaine hasten motor and sensory block as well as prolonged duration of analgesic effects in comparison of solo use of bupivacaine without inducing any side effects except some sedation

in postoperative period. Therefore, we strongly recommend use of clonidine as adjuvant to bupivacaine in axilary brachial plexus block. However, studies on larger populations are warranted to assess the exact doses of adjuvant clonidine and duration of its analgesic effects.

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Conflict of Interest: Nil
Source of support:Nil