International Journal of Medical Science and Education

An official Publication of Association for Scientific and Medical Education (ASME)

Original Research Article

THE EFFICACY OF FENTANYL AND CLONIDINE AS AN ADJUNCT TO LOCAL ANAESTHETICS IN SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK: RANDOMIZED DOUBLE-BLIND CONTROLLED STUDY

Dr. Brajesh Kumar Ratre[1], Dr. Vandana Mangal[2], Dr. Gaurav Sharma[3*], Dr. Neena Rungta[4], Dr. Santosh Choudhary[5], Dr. Vishnu Kumar Garg[6]

1.and 6.Senior Resident, Dept of Onco-Anaesthesia, DR. B.R.A. *Institute Rotary Cancer* Hospital, *All India Institute of Medical Sciences, New Delhi., 2.Professor, Dept of Anaesthesia, SMS Medical Collages, Jaipur, 3. Associate Professor, Dept of Anaesthesia, RUHS College of Medical Science, Jaipur. 4. Professor, Dept of Anaesthesia Jaipur National University Medical College and Hospital, Jaipur.5. Assistant Professor, Dept of Anaesthesia, RNT Medical College, Udaipur.*

***Email id of the corresponding author- gauravjln@yahoo.co.in**

Received: 10/12/2016 ***Revised: 26/03/2017*** ***Accepted: 03/04/2017***

ABSTRACT

Background: This study was designed to assess the effects of fentanyl and clonidine on the onset of sensory and motor block, intra-operative hemodynamic changes and postoperative analgesia during supraclavicular brachial plexus block. **Method:** 135 adult ASA physical status I and II, scheduled for elective hand and upper limb surgeries were randomly allocated to three groups by using chit in a box method. Group I received 0.25% bupivacaine 20 ml and 1.2% lignocaine 10 ml, group II received equal volume of 0.25% bupivacaine and 1.2% lignocaine with fentanyl 50 microgram and group III received equal volume of 0.25% bupivacaine and 1.2% lignocaine with clonidine 75 microgram. The supraclavicular block was performed by paresthesia technique. Patients were observed for onset and duration of sensory and motor block, duration of analgesia, hemodynamic variation, postoperative pain and side effect. **Result**: The addition of both fentanyl and clonidine to bupivacaine lignocaine mixture decreases the onset time of sensory block ($p<0.05$). The duration of both sensory block and motor block was significantly prolonged in fentanyl ($p < 0.001$) as well as clonidine ($p < 0.001$) groups. The mean duration of analgesia in control was 256.78±41.288 (min), in fentanyl 455.44±75.301 and clonidine was 619.33±72.344 (min).The p-value was <0.001 between the Groups and found to be statistically significant. **Conclusions**: We concluded that the addition of 50 microgram fentanyl or 75 micrograms of clonidine in local anaesthetic solution in supraclavicular brachial plexus block prolongs the duration of the block and postoperative analgesia and clonidine is more significantly prolongs than fentanyl.

Keywords: supraclavicular block, fentanyl, clonidine

INTRODUCTION:

Supra-clavicular brachial plexus block technique is widely employed regional nerve block and it is very popular and for analgesia and perioperative anaesthesia for surgery of upper extremity, especially in patients who are at higher risk under general anaesthesia.Various studies have

investigated several adjuvants to Hasten initiation and prolongation the duration of analgesia, including epinephrine, midazolam, neostigmine, hyaluronidase, ketamine, bicarbonate etc. (1-3) The results had been inconclusive, because of associated side effects or doubtful efficacy.

The combination of adjunctive analgesics, for example opioid (fentanyl) and alfa-2 adrenergic receptor agonist (clonidine) to anaesthetics (local) had been reported to increase the duration and quality of neural sensory blockade, and reduce the doses of local anaesthetics and the supplemental analgesia(4,5). Likewise, smaller fractional dose of local anaesthetics can be used and also non-toxic plasma levels achieved.

The aim of present study was to evaluate the spectrum of clonidine and fentanyl on the beginning of sensory and motor block, intraoperative hemodynamic changes, and postoperative analgesia during supra-clavicular brachial plexus block.

METHOD:

The study was prospective, Randomized, Double-Blind, Case-control study approved by our institutional Ethical review committee.

After receiving written informed consent from the patients, 135 adults (20-50 years of age), ASA physical status I and II, scheduled for elective hand and upper limb surgeries were included. Patients with local pathology at the site of injection or disability limiting the performance of block and ASA physical status III and IV were excluded from the study. No patient received any premedication.

Patients were randomly allocated to three groups by using chit in a box method. Group I received 0.25% bupivacaine 20 ml and 1.2% lignocaine 10 ml, group II received equal volume of 0.25% bupivacaine and 1.2% lignocaine with fentanyl 50 microgram and group III received equal volume of 0.25% bupivacaine and 1.2% lignocaine with clonidine 75 microgram. The drug solution was prepared by an anaesthesiologist not involved in data collection. Patient and the anaesthesiologist performed the block were unaware of the group assigned.

The supraclavicular block was performed by paraesthesia technique. The area was painted with povidone iodine 10%, under all aseptic precautions a skin wheal was raised with a local anaesthetic (Inj. Lignocaine2%) 1.5 to 2.0 cm posterior to the midpoint of the clavicle with a 23G hypodermic needle. Next, a 22G, 50 mm needle was passed through the same point in a caudal, slightly medial and posterior direction, until either a paraesthesia was elicited or the first rib was encountered. If the first rib was encountered, the needle was walked over the first rib until a paraesthesia was elicited either in the hand or arm. After eliciting paraesthesia and negative aspiration for blood, one milliliter of the test solution was injected to test for inadvertent intravascular placement of the needle. All subjects were observed for possible intravascular placement for approximately 1 minute following the injection of the test solution, and then the remaining 29 mL of the anaesthetic was administered in 5-mL increments following repeated aspiration. After the performance of nerve block, patients were evaluated for onset of the sensory block every 1 minute. The sensory block was assessed by pinprick with 25 gauge hypodermic needle. The sensory onset was defined as the loss of pain to pinprick in skin dermatomes C4-T2[0 –No block, 1 –Partial block (Touch sensation only), 2 –Compete for the block (Not even touch sensation)]. Motor blockade was checked by Modified Bromage scale (0 - Able to raise the extended arm to 90° for a full 2 seconds,1- Able to flex the elbow and move the fingers but unable to raise the extended

arm, 2 - Unable to flex the elbow but able to move the fingers; and 3 - Unable to move the arm, elbow, or fingers). The sensory blockade and motor blockade were checked every minute till the block was established. The onset times of sensory and motor block were noted. Heart rate, non-invasive blood pressure, and SPO2 were measured every 5 minutes for first 15 minute and thereafter every 15 minutes. Sedation score was assessed as described by Culebraset al (1- Awake and alert, 2- Sedated, responding to verbal stimulus, 3-Sedated, responding to mild physical stimulus, 4- Sedated, responding to moderate or severe physical stimulus, 5- not arousable)

Postoperatively heart rate, noninvasive blood pressure, VAS (Graded from 0 -10, 0 being no pain at all and 10 being worst pain imaginable) and Bromage Score were recorded at 0 min, 30 min, 1 hr, 3 hr, 6 hr, 12 hr, 18 hr and 24 hr.

Rescue analgesic (Inj Tramadol 100mg IV) was administered at VAS score > 4 and the time was noted.

Time of return of complete motor power was recorded. Any side effects of fentanyl and clonidine such as itching, bradycardia, hypotension, dizziness were recorded.

Statistical Analysis:

Statistical analysis was performed using statistical software SPSS. Data were analysed using unpaired student "t" test for data on ratio and interval scale whereas data on ordinal and nominal scales were compared using Mann Whitney's U test and Chi-Square test respectively.

A "p" value of less than 0.05 was considered significant.

RESULT:

Demographical data and duration of surgery were comparable in the groups (Table 1). Baseline parameters were also comparable in groups (Table 2). The addition of both fentanyl and clonidine to bupivacaine lignocaine mixture decreases the onset time of sensory block ($p<0.05$). The duration of both sensory block and motor block was significantly prolonged in fentanyl ($p < 0.001$) as well as clonidine ($p < 0.001$) groups. The mean duration of analgesia in control was 256.78±41.288 (min), in fentanyl 455.44±75.301 and clonidine was 619.33±72.344 (min).The p-value was <0.001 between the Groups and found to be statistically significant. The total requirement of rescue analgesic (Tramadol 100 mg) during first 24 hrs postoperative period was significantly less in fentanyl and clonidine group.

Heart rate, systolic and diastolic blood pressure was lower in the clonidine group compared to control and fentanyl group. However, no episode of bradycardia and hypotension was reported in any patient. The patients in clonidine group were found more sedated 15 minutes after block to 1 hour postoperatively but no patient experienced airway compromise or required any airway assistance. One patient in fentanyl group experienced nausea and one episode of vomiting during the postoperative period.

DISCUSSION:

In the present study, it was reported that addition of either fentanyl or clonidine to a bupivacaine-lignocaine mixture in supra clavicular brachial plexus block statistically prolongs the both sensory and motor block duration, analgesia and also reduces the necessity of rescue analgesic.

Furthermore, the beginning of sensory block found decreased by both fentanyl and clonidine. In the meta-analysis conducted by Deniel M.

Popping6 reported that combination of clonidine significantly prolongs the duration of the postoperative analgesia. Chavan et al7 also reported that the combination of a small dose to the local anaesthetic solution of fentanyl mixture in supra clavicular brachial plexus block may increase the time duration of analgesia.

In this study, we reported that the time span of sensory block, motor block and also the continuance of analgesia was statistically higher in clonidine as compared to the fentanyl group (p value< 0.001). we haven't found any study that compares these two drugs for supra clavicular brachial plexus block. The mechanism of activity of fentanyl is much different than clonidine, In peripheral nerve fentanyl close N-type voltage-gated OP2-receptor agonist calcium channels and OP3, OP1 receptor agonist calcium-dependent inwardly amending potassium channels. This outcomes into reduced neuronal excitability and hyperpolarization.

Fentanyl reduces the intracellular cAMP by supressing adenylate cyclase action. Afterwards, emancipation of nociceptive neurotransmitters for example dopamine, substance P, GABA, noradrenaline and acetylcholine is inhibited. Clonidine has some intrinsic properties to block conduction in A? and C fibres and will rectify conduction of local anaesthetics block. Clonidine possibly increase or rectify the sodium channel blocking action of local anaesthetic agents by opening the potassium channels and results into membrane hyperpolarisation, a state in which the cell is unresponsive to excitatory input8.

Nakamura M et al reported that Peripheral antinociception actuated by clonidine had also been associated with alpha-adrenoceptor mediated local emancipation of enkephalin-like subatances9. Hypotension and bradycardia are contemplate to be the most prevalent adverse effect of clonidine. In the present study, although we found slightly low systolic b.p. and diastolic blood pressure, heart rate in the clonidine group but none of the patient had bradycardia or hypotension.

This may be because we added a smaller dose of clonidine. One patient of the clonidine group had nausea and vomiting in the postoperative period. These side effects were mainly of gastrointestinal origin. One limitation of our study is that we used a addition of bupivacaine and lignocaine. There may be conflict result if fentanyl or clonidine added to another local anaesthetic agent at the onset of sensory or motor block.

The techniques like ultrasound-guided neural blocks offer the advantage of being more objective as the plexus nerves can be identified more accurately, solutions used for neural blockade can be visually confirmed to be deposited at juxtaposition to the plexus and avoid possible trauma to the nerves and tissues and surrounding structures e.g. blood vessels, pleura, etc. The damage to these structures is a possibility and a potential problem in case of blind “elicitation of paraesthesias” technique.

CONCLUSION

We concluded from the present study that after addition of 50 microgram fentanyl or 75 micrograms of clonidine in solution of local anaesthetic used for supra clavicular brachial plexus block, increase the duration of the block alongwith postoperative analgesia and clonidine is more significantly prolongs than fentanyl. Although there is decrease blood pressure and heart rate and also increase sedation was noticed for clonidine recipients but there were no

significant side effects.

REFERENCES:

1. Bedder MD, Kozody R, Craig DB, "Comparison of bupivacaine and alkalinized bupivacaine in brachial plexus anaesthesia", AnesthAnalg 1988; 67: 48–52.

2. Bone HG, Van Aken H, Brooke M, Burkle H, "Enhancement of axillary brachial plexus block anaesthesia by coadministration of neostigmine", RegAnesthPain Med 1999; 24: 405–10.

3. Keeler JF, Simpson KH, Ellis FR, Kay SP, "Effect of addition of hyaluronidase to bupivacaine during axillary brachial plexus block", Br J Anaesth 1992; 68: 68–71.

4. Susmita Chakraborty et al, "Effect of Clonidine as adjuvant in Bupivacaine induced supraclavicular brachial plexus block, a randomized controlled trial", Indian J Pharmacology. Apr 2010 / Vol 42 Issue 2, 74 -77.

5. Nishikawa K, Kanaya N, Nakayama M, Igarashi M, Tsunoda K, Namiki A, "fentanyl improves analgesia but prolongs the onset of axillary brachial plexus block by peripheral mechanism", AnesthAnalg. 2000; 91:384–387.

6. Daniel M. Popping, Nadia Elia, Emmanuel Marret, Manuel Wenk, Martin R. Trame`. A Meta-analysis of Randomized Trials. Clonidine as an Adjuvant to Local Anaesthetics for Peripheral Nerve and Plexus Blocks. Anesthesiology, V 111, No 2, Aug 2009.

7. Shirish G Chavan et al," Effect of addition of fentanyl to local anaesthetic in brachial plexus block on duration of analgesia";Anaesthesia: Essays and Researches; 5(1); Jan-Jun 2011.

8. Butterworth JF, 5th, Strichartz GR. The alpha 2-adrenergic agonists clonidine and guanfacine produce tonic and phasic block of conduction in rat sciatic nerve fibers. AnesthAnalg. 1993;76:295–301.

9. Nakamura M et al, Peripheral analgesic action of clonidine: Mediation by release of endogenous enkephalin-like substances. Eur J Pharmacol; Vol. 146, 223-8, 1988.