ORIGINAL RESEARCH PAPER

Anaesthesiology

Volume - 7 | Issue - 1 | January - 2017 | ISSN - 2249-555X | IF : 3.919 | IC Value : 79.96

CLONIDINE AS AN ADDITIVE TO BUPIVACAINE FOR SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK

KEYWORDS

Clonidine, bupivacaine, brachial plexus block.

Dr S. D. Yennawar

Professor, department of anaesthssiology, dr s c g m c nanded

Dr Anand P Satkar

Senior resident, department of anaesthesiology dr s c g m c nanded. -CORRESPONDING AUTHOR

ABSTRACT

Introduction *: Supraclavicular brachial plexus block was given by using inj bupivacaine either alone or in combination with inj Clonidine. Clonidine has been selected as an adjuvant to bupivacaine because it has been reported to prolong the duration of action of local anaesthetics.*

Aims and objectives*: To observe the effect of addition of Clonidine to bupivacaine on, Onset of analgesia, Onset of motor block, Duration of analgesia and motor blockade ,Side effects*

Materials and methods*: 40 patients with ASA grade 1 and 2, in age group 18 to 60 years, are grouped into two.*

Group 1 (cases) – received 0.375% bupivacaine (25ml) plus 30 mcg clonidine

Group 2 (control) - received 0.375% bupivacaine (25ml).

RESULTS :*mean onset of sensory block in grp 1 in mins 4.25 +/- 1.6 , mean onset of sensory block in grp 2 in mins 8.4 +/- 1.86 mean onset of motor block in grp 1 in mins 8.3 +/- 4.8 , mean onset of motor block in grp 2 in mins 16.8 +/- 4.16 ,mean duration of analgesia in grp 1 in mins 822 +/- 64.6, mean duration of analgesia in grp 2 in mins 300 +/- 32.81 , mean duration of motor block in grp 1 in mins 350.6 +/- 40 mean duration of motor block in grp 2 in mins 160.8 +/-25.22*

DISCUSSION:

Mean age in grp 1 and grp 2 was 30 +/- 13.14 years and 29.60 +/- 14.54years respctively. Mean wt in grp 1 and grp 2 was 56.50 +/- 8.642kg and 57.12 +/- 7.86kg respectively. , Mean ht in grp 1 and grp 2 was 165.5 +/- 5.77 cm and 166.6 +/- 4.480cm respectively. Duration of surgery in grp 1 and grp 2 was 154.4 +/- 28.30minand 156.4 +/- 30.65min respectively. Group 1 contain 11 male and 9 females, group 2 contains 10 male and 10 females

CONCLUSION: *Addition of clonidine to bupivacaine in brachial plexus block significantly prolongs the duration of analgesia and motor block in patients undergoing upper limb surgeries and is remarkably safe and cost effective method of providing post operative analgesia.*

INTRODUCTION

Supraclavicular brachial plexus block is most commonly used regional nerve block for upper extremity. it is most common method of anaesthesia and perioperative pain management in surgery below the shoulder joint. Pneumothorax, horners syndrome and phrenic nerve block are some complications but their occurance rate is very low.

The concurrent injection of Alpha2 adrenergic agonist drug with local anaesthetics has been suggested to improve the nerve block characteristic of local anaesthetic solutions through either local vasoconstriction [1] and facilitation of C fibre blockade [2] or a spinal action caused by slow retrograde axonal transport or simple diffusion along the nerve.[3] Clonidine is a selective Alpha2 adrenergic agonist with some Alpha1 agonist property. In clinical studies, the addition of clonidine to local anaesthetic solutions improved peripheral nerve blocks by reducing the onset time, improving the efficacy of the block during surgery and extending postoperative analgesia. [4,5] The effect of clonidine is dose related between 0.1 and 0.5 μg/kg. [5] Clonidine possibly enhances or amplifies the sodium channel blockade action of local anaesthetics by opening membrane hyperpolarization, a state in which the cell is unresponsive to excitatory input[6].

A number of these studies have focused on the effect of clonidine as adjuvant to either lignocaine [5] ormepivacaine. [4] Further, these studies were done using clonidine 150 μg, a moderately high dose with its attendant risk of adverse drug reactions. In a few clinical studies, a lower dose of clonidine (0.1-0.5 μg/kg) was used as adjuvant for brachial plexus block. [4] Considering the fact that Indian population has relatively lower body weight and that there are few studies with low dose clonidine, we planned to use low dose clonidine in our study.

In a randomized, prospective, double blinded and controlled study, we included 40 patients of ASA grade 1-2 between age group 18-60 years undergoing upper limb surgery below shoulder joint. The supraclavicular brachial plexus block was performed and bupivacaine either alone or combined with clonidine was administered. The block was performed using a nerve locator in all cases. The onset and duration of analgesia and motor block and any complications were evaluated.

Aims and objectives

To observe the effect of addition of Clonidine to bupivacaine on
Onset of analgesia
Onset of motor block
Duration of analgesia and motor blockade
Side effects

METHODS AND MATERIALS

After obtaining approval from hospital ethical committe and written, informed valid consent, 40 patients were included in the study. The study population included patients of either sex, ASA grade 1 and 2 in the age range of 18-60 years. All patients were posted surgeries below the shoulder joint and received supraclavicular brachial plexus block.

Study design:

The study was a randomised, prospective, single blinded and controlled study.

Inclusion criteria:

- Age group 18-60 years
- ASA grade 1 and 2
- Upper limb surgery below shoulder joint (both elective and emergency surgery)

Exclusion criteria:

- Consent not given
- ASA Grade 3 and 4
- bleeding disorder and patient on anticoagulants
- Severe respiratory disease
- Neuro deficit involving brachial plexus

Volume - 7 | Issue - 1 | January - 2017 | ISSN - 2249-555X | IF : 3.919 | IC Value : 79.96

- Local infection at the injection site
- History of allergy to local anaesthetic
- pregnant women

Patients were randomly allocated to one of the two groups .
Group 1 (cases): Patients in this group received 0.375% bupivacaine (25ml) plus inj Clonidine 30mcg.

Group 2 (control): Patients in this group received inj bupivacaine (25ml).

Investigations: blood investigations, chest x ray, kidney function tests, ecg

Drug solution used and dosage:
- inj bupivacaine 0.375% 25ml .
- inj Clonidine 30mcg.

Total volume of solution in both groups was 25ml.

Monitoring:
Standard monitors were attached-
- Pulse oximetry for saturation(SpO2)
- electrocardiogram
- blood pressure monitoring .

an intravenous drip was secured before stsrting the procedure. parameters were observed during the procedure.

Instruments
1. insulated stimulator needle
2. peripheral nerve locator
3. ecg electrodes
4. syringes (20ml)
5. skin marker pen
6. sterile bowls
7. sterile gauze piece, forceps and drapes.

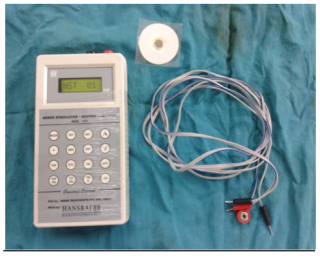

Figure 1

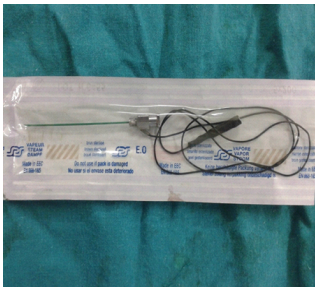

Figure 2

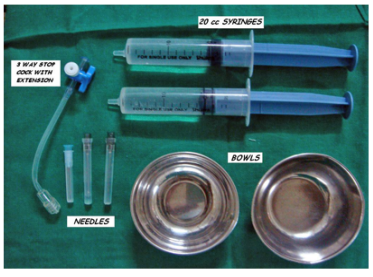

Figure 3

Brachial plexus block:
We carried out brachial plexus block through supraclavicular approach after thoroughly explaining procedure to the patients.

1) supraclavicular approach was used for brachial plexus block .nerve stimulator was used during the procedure. we asked patient to lie down in supine position without a pillow, and to keep arms at sides, and to turn head on opposite side. we placed small pads below shoulder.
2) Part of neck was aseptically cleaned and draped.
3) the anaesthetist stood on the same side to be blocked.
4) The lateral border of the sternocleidomastoid(SCM) muscle was identified and traced down to the point where it meets clavicle. Needle was inserted about 2-2.5cm lateral to this point. the site is confirmed by palpation of subclavian artery.
5) the site was infiltrated with local infiltration of 1 ml of 2% lignocaine.
6) Insulated needle was used to perform the technique. after connecting the needle to the nerve locator, stimulation with an intensity of 2.0mA and pulse width of 100 μs was started. once response is seen, we go on decreasing the current till 0.6mA and if still response persist the drug was injected.
7)we massaged the area following injection which helps to spread the drug along the track.
8)the patient was carefully monitored during and after the block for any side effects and toxicity of drug.

The following parameters were studied:
Onset of analgesia:
we measured the time from injection to onset of analgesia in major peripheral nerve distributions (radial, ulnar, median, musculocutaneous). analgesia was assessed by pinprick using blunt end of 27-gauge needle at 0, 3, 5, 8, 10, 12, 15, 18, 20 and 25 min respectively.

analgesia was graded as follows:
0 = no block (normal sensation),
1 = partial block (decreased sensation),
2 = complete block (no sensation).

Onset of motor block:
we measured the time from injection to the inability of patient to to move fingers or to raise the arm. block was measured at 0, 5, 10, 15, 20 and 25 min respectively by assessing following movements.elbow flexion and extension, extension of wrist, opposition of thumb and index finger and opposition of thumb and little finger. motor block was graded according to following
0 = no block,
1 = partial block (decreased muscle activity), and
2 = complete block (no muscle activity).

Duration of analgesia:
we considered the anaesthesia as complete and satisfactory when there was no complaint of pain and discomfort from the patient during the procedure. Analgesia duration was noted according to VAS for half hourly for first 10 hours and then hourly till 24 hours. When VAS was about 8-10, we considered it as termination of analgesic action and was administered rescue analgesic in the form of im diclofenac.

Duration of motor block:
Postoperatively motor block was assessed hourly by asking patients to move fingers and to raise the hand. If they able to do so, it was considered as the termination of motor block.

Possible side effects of brachial plexus block:
Possible side effects of brachial pexus block were looked for like Horner's syndrome, phrenic nerve palsy, pneumothorax, respiratory depression, sign and symptoms for local anaesthetic toxicity.

Volume - 7 | Issue - 1 | January - 2017 | ISSN - 2249-555X | IF : 3.919 | IC Value : 79.96

The block was supplemented by general anaesthesia in case of patchy or inadequate action and such cases were excluded from the study.

Statistical analysis :
Unpaired 't' test was used to analyse the data obtained in this study. The 'p' value obtained was applied as follows

- If p> 0.05, it means that there is no significant difference between the means of two groups studied.
If p=0.05, means there is a significant difference at 5% level of significance
- If p< 0.01, means the data is significant at 1% level of significance

RESULTS
TABLE 1

GROUPS	GROUP 1		GROUP 2		P VALUE
MEAN AGE(YEARS)	30		29.60		>0.05
WEIGHT(KG)	56.50		57.12		>0.05
DURATION OF SURGERY(MIN)	154.4		156.4		>0.05
HEIGHT(CM)	165.5		166.6		>0.05
SEX DISTRIBUTION	male	female	male	female	>0.05
	11	9	9	10	

Table 2

groups	Group 1	Group 2	P value
Onset of analgesia(min)	4.25	8.4	<0.001
Onset of motor block (min)	8.3	16.8	<0.001
Duration of analgesia(min)	822	300	<0.001
Duration of motor block (min)	350	160	<0.001

Discussion
Regional anaesthesia has been widely used nowadays for most of the surgical procedures. Regional anaesthesia has advantage over general anaesthesia that it can provide analgesia during post operative period as well and also it avoids complications of general anaesthesia.

In brachial plexus block, local anaesthetic drug is injected in fascial spaces surrounding brachial plexus. This technique of regional anaesthesia is very effective in surgeries of upper limb. This technique is specially helpful when the patient is not fit for general anaesthesia due to comorbid conditions such as uncontrolled diabetes, cardiovascular and respiratory diseases. In our study we used supraclavicular approach to brachial plexus block.

In our study Clonidine was used as adjuvant to bupivacaine. Our study was randomised prospective single blinded and controlled study. fourty patients posted for upper limb surgeries below shoulder joint were given brachial plexus block by supraclavicular approach. The patients were randomly allocated in two groups 40 patients with ASA grade 1 and 2, in age group 18 to 60 years,

are grouped into two.
Group 1 (cases) – received 0.375% bupivacaine (25ml) plus 30 mcg clonidine
Group 2 (control) - received 0.375% bupivacaine (25ml).

In our study the mean age of group 1 was 30+/- 13.14 years and in group2 29.60+/-14.54 years. By using unpaired "t" test, it was found that there was no significant statistical difference between the the two groups (p> 0.05) and the two groups are comparable. (Table 1)

the mean weight of group 1 was 56.50+/- 8.642 kg and in group2 57.12+/-7.86kg y. By using unpaired "t" test, it was found that there was no significant statistical difference between the the two groups (p> 0.05) and the two groups are comparable. (Table 1)

the mean height of group 1 was 165.5+/- 5.77 cm and in group2 166.6 +/-4.480 cm . By using unpaired "t" test, it was found that there was no significant statistical difference between the the two groups (p> 0.05) and the two groups are comparable. (Table 1)

the mean duration of surgery of group 1 was 154.4 +/- 28.30 cm and in group2 156.4 +/- 30.65 cm . By using unpaired "t" test, it was found that there was no significant statistical difference between the the two groups (p> 0.05) and the two groups are comparable. (Table 1)

there were 11 male patients and 9 female patients in group 1 . in group 2 there were 10 male patients in group 1 and 10 female patients in group 2. These groups were comparable regarding sex distribution.(table 1).

In our study, mean onset of analgesia in group 1 was 4.25 +/- 1.6 min and in group 2 was 8.4 +/- 1.86min respectively (P< 0.001) (table 2) (chart 1)

mean onset of motor block in group 1 was 8.3 +/- 4.8min and in grp 2 was 16.8 +/- 4.16 min respectively. (P< 0.001) (table 2) (chart 2) both these data are statistically significant. So our study shows that there was significant difference between onset of analgesia and onset of motor block between the two groups.

In a study carried by Susmita Chakraborty, Jayanta Chakrabarti, Mohan Chandra Mandal, Avijit Hazra and Sabyasachi Das[7] studied effect of clonidine as adjuvant in bupivacaine-induced supraclavicular brachial plexus block. In a randomized controlled trial they found that onset of sensory block was 6.2 ± 0.78 min with bupivacaine and Clonidine and 8.7 ± 1.01 min with bupivacaine alone. Onset of motor block was 10.6 ± 1.36 min in Clonidine with bupivacaine and 18.1 ± 1.35 min with bupivacaine alone. So clonidine significantly reduces the time required for onset of sensory and motor block. Our study also showed that addition of Clonidine to bupivacaine for brachial plexus block shortens the onset of sensory and motor block.

In our study , mean duration of analgesia in group 1 was 822+/-64.6 min and in group 2, 300+/-32.81min respectively (table 2) (chart 3). It shows that there is statistically significant difference between two groups regarding duration of analgesia.(table 2).

Various studies in which Clonidine was used in peripheral nerve block found that Clonidine with Bupivacaine improves analgesic characteristics compared to Bupivacaine alone. McCartney et al[9]., found that a Bupivacaine and Clonidine combination prolonged postoperative analgesia compared to a Bupivacaine alone when administered for various peripheral nerve blocks.

Eledjam J.J et al[10]., showed Clonidine is an attractive alternative to epinephrine to prolong duration of analgesia in supraclavicular brachial plexus block. Hutschala. D et al [11,14,] found lower plasma concentration of Clonidine after brachial plexus block which strongly suggested its local effect on peripheral nerves. Clonidine produces this additive effect on local anaesthetics by its action on the presynaptic alpha-2 receptor complexes present on peripheral nerves.

YaDeau JT et al[12], found prolonged duration of analgesia after popliteal fossa blockade with bupivacaine. J.J.Lee et al[13], found improved efficacy of caudal analgesia in children when Clonidine was added to bupivacaine. Dobrydnjov etal[14], shown the use of Clonidine added to small dose of bupivacaine intrathecally increased the spread and duration of analgesia and produced an effective spinal anaesthesia.

Our study also shows that addition of Clonidine to bupivacaine for brachial plexus block prolongs the duration of analgesia.

In our study, mean duration of motor block in group 1 was 350.6+/-

Volume - 7 | Issue - 1 | January - 2017 | ISSN - 2249-555X | IF : 3.919 | IC Value : 79.96

40min and in group 2, 160.8+/-25.22min respectively (table 2) (chart 4). It shows that there is statistically significant difference between two groups regarding duration of motor block.(table 2).

A prospective, randomized, double blind, placebo controlled study was conducted by chakraborty, et al[7] to assess the efficacy of Clonidine as an adjuvant to bupivacaine in brachial plexus block. The duration of analgesia(Clonidine group 415.4 ± 38.18 min and bupivacaine group 194.2 ± 28.74 min) and duration of motor block (Clonidine group 330.4 ± 31.68 min and bupivacaine group 144.8 ± 17.31 min) was longer in Clonidine group. These results are comparable with our study.

In a randomized controlled double-blinded prospective study by Shivinder Singh and Amitabh Aggrwal[8], Department of Anaesthesiology and Critical Care, Armed Forces Medical College, Pune,, India, observed that addition of Clonidine to bupivacaine resulted in longer duration of analgesia (as assessed by visual analogue score) and prolongation of the motor block (as assessed by modified Lovett rating scale). Our study also show that addition of Clonidine to bupivacaine for brachial plexus block significantly prolongs duration of analgesia and duration of motor block.

The prolonged analgesia of clonidine is by inhibiting action potential of A & C fibres in peripheral nerves as demonstrated by Gaumann et al[15]., Many authors favour the hypothesis that Clonidine exerts its local anaesthetic prolonging effect directly on nerve fibre, as a result of complex interaction between Clonidine and axonal ion channels or receptors. Masuki et al[16], suggested Clonidine may produce local vasoconstriction resulting in a delayed absorption of local anaesthetic and block prolongation. Butterworth et al[17] found Clonidine to produce tonic and phasic block of nerve conduction in rat sciatic nerve fibres by directly binding to Alpha-2 adrenergic receptors on presynaptic peripheral nerves to modify neuronal excitability.

So in our study it is seen that addition of Clonidine to bupivacaine for supraclavicular brachial plexus block results in faster onset of sensory and motor block and prolongation of analgesia and motor block.

Conclusion

Addition of Clonidine to bupivacaine results in faster onset of sensory and motor block and prolongation of analgesia and motor block for patients undergoing surgery of upper limb, and is an effective method of post operative analgesia.

Referrences

1. Gaumann DM, Forster A, Griessen M, Habre W, Poinsot O, Della Santa D. Comparison between clonidine and epinephrine admixture to lidocaine in brachial plexus block. Anesth Analg 1992;75:69-74.
2. Gaumann DM, Brunet PC, Jirounek P. Clonidine enhances the effects of lidocaine on C-fiber action potential. Anesth Analg 1992;74:719-25.[PUBMED] [FULLTEXT]
3. Khasar SG, Green PG, Chou B, Levine JD. Peripheral nociceptive effects of alpha 2-adrenergic receptor agonists in the rat. Neuroscience 1995;66:427-32. [PUBMED] [FULLTEXT]
4. Singelyn FJ, Gouverneur JM, Robert A. A minimum dose of clonidine added to mepivacaine prolongs the duration of anesthesia and analgesia after axillary brachial plexus block. Anesth Analg 1996;83:1046-50. [PUBMED] [FULLTEXT]
5. Bernard JM, Macarie P. Dose-range effects of clonidine added to lidocaine for brachial plexus block. Anesthesiology. 1997;87:277–84. [PubMed]
6. 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. Anesth Analg. 1993;76:295–301.
7. Hutschala D, Mascher H, Schmetterer L, Klimscha W, Fleck T, Eichler HG et al.Clonidine added to bupivacaine enhances and prolongs analgesia after brachial plexus block via a local mechanism in healthy volunteers. Eur J Anaesthesiol 2004 Mar;21(3):198-204.
8. Shivinder Singh and Amitabh Aggrwal , Department of Anaesthesiology and Critical Care, Armed Forces Medical College, Pune,, India
9. McCartney CJ, Duggan E, Apatu E. Should we add clonidine to local anesthetic for peripheral nerve blockade ? A qualitative systematic review of the literature. Reg Anesth Pain Med 2007 Jul-Aug,32(4) :330-8
10. Eledjam JJ, Deschodtt J,Viel EJ, Lubrano JF,Charavel P, d'Athist F,du Cailart J. Brachial plexus block with bupivacaine: effects of added alpha-adrenergic agonists : comparison between clonidine and epinephrine. CAN J Anesth.1991 Oct; 38(7) :870-5.
11. D. Hutschala , H. Mascher , L. Schmetterer , W. Klimscha , T. Fleck , H.-G. Eichler, E.M. Tschernko. Clonidine added to bupivacaine enhances and prolongs analgesia after brachial plexus block via a local mechanism in healthy volunteers. European Journal of Anaesthesiology (2004), 21:3:198-204
12. Jacques T. YaDeau, Vincent R. LaSala,Leonardo Paroli, Richard L. Kahn, Kethy M. Jules-Elyse´e, David S. Levine, Barbara L. Wukovits, RN, Jane Y. Lipnitsky. Clonidine and Analgesic Duration After Popliteal Fossa Nerve Blockade: Randomized, Double-Blind, Placebo-Controlled Study. Anesth Analg Vol. 106, No. 6, June 2008
13. J. J. Lee, A. P. Rubin. Comparison of a bupivacaine-clonidine mixture with plain bupivacaine for caudal analgesia in children. Br. J. Anaesth. (1994) 72 (3): 258-262.
14. I. Dobrydnjov, K. Axelsson, S.-E. Tho¨rn, P. Matthiesen, H. Klockhoff, B. Holmstro¨m, and A. Gupta. Clonidine Combined with Small-Dose Bupivacaine During Spinal Anesthesia for Inguinal Herniorrhaphy: A Randomized Double-Blinded Study. Anesth Analg 2003;96:1496 –503
15. Dorothee M. Gaumann, MD, Pascale C. Brunet, PHD and Petr Jirounek,-Clonidine Enhances the Effects of Lidocaine on C Fiber Action Potential. A & A May 1992 vol. 74 no. 5 719-725
16. Masuki S, Dinenno FA, Joyner MJ, Eisenach JH. Selective Alpha-2 adrenergic properties of dexmedetomidine over clonidine in the human forearm. J Appl Physiol 2005;99:587–92.
17. Butterworth JF, Strichartz GR. The alpha-2 adrenergic agonists clonidine and guanfacine produce tonic and phasic block of conduction in rat sciatic nerve fibers. Anesth Analg 1993;76:295–301