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Original Research Paper

A Comparative Study of Intrathecal Bupivacaine Alone and Intrathecal Bupivacaine and Clonidine Combination for Postoperative Analgesia in Caseof Lower Limb Orthopaedic Surgeries

Medical Science

KEYWORDS : clonidine, intrathecal, analgesia

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ABSTRACT

Post operative analgesia is not only desirable but also is of utmost necessity for all surgical patients. Clonidine prolongs both sensory and motor effect of intrathecal bupivacaine through activation of post synaptic α2 receptors in substantia gelatinosa of spinal cord. The following study was undertaken to observe onset of motor block, sensory block, duration of postoperative analgesia by using 0.5% Bupivacaine heavy 3cc with clonidine 30 ug and without clonidine intrathecally. In conclusion, the addition of intrathecal Clonidine 30 mcg to hyperbaric Bupivacaine prolongs the duration of postoperative analgesia compared to Bupivacaine alone. There was a marked reduction in supplementary rescue analgesic demand in clonidine group.

INTRODUCTION

In developing countries like India , regional anaesthesia techniques like spinal , epidural anaesthesia has got a definite role because of economic reasons ,non availability of medical gases and various drugs and equipments of general anaesthesia. Spinal anaesthesia was first used by August Bier[1]. Barker[2] in 1907 used glucose containing solution in spinal anaesthesia with local anaesthetic agents like bupivacaine and lignocaine ,thus the term "Heavy" came into action.

Post operative analgesia is not only desirable but also is of utmost necessity for all surgical patients. The vicious circle pain generates is detrimental to the process of recovery, and upsets the physiology. Effective post operative analgesia reduces patient's anxiety, accelerates recovery, reduces hospital stay and hence cost effective. Patients controlled analgesia, spinal opioids, regional analgesic techniques have provided better pain relief than intermittent doses of opioids parenterally or orally with minimum side effects.

Morphine was the first opioid administered intrathecally to augment neuraxial blocks. Other non-opioid drugs have recently been proved to have analgesic effects.

Non-opioids :

a) a2-adrenergic agonists: Clonidine, ST914 Tizanidine5 (experimental in rats)

b) Anticholinesterases: Neostigmine

c) Benzodiazepines: Midazolam

d) Steroids : Methylprednisolone

e) Ketamine

f) Endogenous nucleosides: Adenosine6 (experimental in rats)

g) Miscellaneous : Tenoxicam, Somatostatin, Octreotide, Droperidol, Calcitonin.[3]

Clonidine is an imidazole derivative closely related chemically to tolazoline.

It is a selective α2 adrenergic agonist that exerts its effects by acting on α2 adrenergic receptors in the brain stem. It is a partial agonist with higher affinity and intrinsic activity at α2 receptors. It prolongs both sensory and motor effect of intrathecal bupivacaine through activation of post synaptic α2 receptors in substantia gelatinosa of spinal cord. Inhibitory action of clonidine on catecholaminergic area of the lower brain stem is responsible for anxiolytic effect.

AIMS AND OBJECTIVES

The following study was undertaken to observe onset of motor block, sensory block, duration of postoperative analgesia by using 0.5% Bupivacaine heavy 3cc with clonidine 30 ug and without clonidine intrathecally. The study is carried out with following aims:

1.)To review the literature regarding the use of intrathecal clonidine and post operative analgesia
2.)To observe the effect of intrathecal clonidine on onset and duration on onset and duration of sensory motor block.
3.)To observe the duration of analgesia

MATERIAL AND METHODS

60 patients were randomly selected for the comparative study of postoperative analgesia provided by intrathecal clonidine (30 ug) bupivacaine heavy(15 mg) combination alone and bupivacaine heavy (15mg) alone.

Patients belonging to ASA grade I and II and III were choosen for the study, posted for lower limb orthopaedic surgery.. The study was conducted in Orthopaedic department of TMC and DR.BRAM teaching hospital, hapania agartala.

They were divided in to two groups, having 30 patients in each group.

GroupA -Bupivacaine heavy 0.5% 3 cc(15mg) +Inj. Normal saline 0.2 ml.

GroupB -Bupivacaine heavy 0.5% 3 cc (15 mg) +Clonidine (30 mcg).

PREANAESTHETIC ASSESSMENT :

All patients were thoroughly examined on the previous day of the operation and again in pre anaesthesia room in the morning on the day of surgery. A history of any present or past illness and detailed general as well as systemic examination were done and investigations were checked. Visual analogue scale was shown to the patient and the procedure of post operative pain measurement was explained in detail. Baseline vitals were noted and informed written consent was obtained from patient and his or her close relative.

On the day of surgery, Intravenous line was taken and injection Ringer Lactate (RL) was started for preloading.

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PREMEDICATION:
Injection Glycopyrollate 4 µg/kg (0.2 mg) I.V. Vital like pulse, B.P., R.R. and SPO2 were noted before premedication and after premedication.

PREOPERATIVE OBSERVATION :After attaching ECG monitor and pulse oxymeter vitals like temperature, pulse, blood pressure and respiratory rate and SPO2 were noted.

EQUIPMENTS : Equipments used in the study consist of - An autoclaved tray consisting of instrument used for painting and draping,Disposable 23 G quinke's spinal needle,Disposable 5 cc syringe for Bupivacaine heavy,Disposable 2cc syringe for clonidine. Drugs :
Inj. Bupivacaine 0.5% heavy 1 ampule. Inj. Clonidine preservative free 1 ampule.

TECHNIQUE : Each patients was preloaded with 15 ml/kg of Ringer's Lactate solution about 15 min before the intended time of intrathecal drug administration. Patients were positioned in the left lateral position and after adequate and aseptic precaution; lumbar puncture was performed at L3-4 intervertebral space using midline approach with a 23 gauge, quincke spinal needle. After ensuring free flow of CSF, patients in the group C received a single dose of 15 mg of 0.5% Bupivacaine heavy + 30ug of preservative free clonidine. The patients in the group B received 15 mg 0.5% Bupivacaine heavy only. Following injection of drugs patient was immediately placed in supine position.

MONITORING : All the patients were monitored in the form of blood pressure, heart rate, respiratory rate and ECG and oxygen saturation (SPO2) at 1 min, 5 min, 10 min, 15 min and then every 15 min interval.

EVALUATION ; Onset of sensory and motor blockade, quality of surgical anaesthesia level of consciousness and status of tongue were evaluated as follows :

(i)Onset of sensory blockade :Time required in seconds to produce loss of pinprick sensation bilaterally at shin of tibia. (L4 dermatome).
(ii)Onset of motor blockade : Modified bromage criteria (by Logan wild smith)

Scale	Criteria	Degree of block
0	Free movement of legs and feets with ability to raise extended legs	None
1	Inability to raise extended leg, knee flexion decreased but full flexion at ankle and feet present	33% (partial)
2	Inability to raise legs or flex knees, flexion at ankle and feet present	66% (partial)
3	Inability to raise legs, flex knees or ankle or moves toes	Complete paralysis.

Intraoperative bradycardia was treated with injection Atropine 0.6 mg IV and Hypotension was treated with injection mephentermin 5 mg IV and fast IV fluids.

POSTOPERATIVE MONITORING :
After surgery, patients were shifted to the recovery room and temperature, pulse rate, blood pressure, respiratory rate, SPO2 and visual analogue scale (VAS) were measured every 1 hour for 3 hours and then at three hour interval upto 12 hours and at 18th and 24th hour for 24 hours.
Time of regression of analgesia to pin prick below T12 dermatome was considered as duration of anaesthesia. Supplemental analgesia was administered in form of injection Diclofenac sodium 75 mg I.M. when VAS is > 5 and it was considered as duration of postoperative analgesia. The number of doses required in 24 hours were recorded. Duration, intensity and number of episodes of nausea, vomiting, bradycardia hypotension, respiratory depression and were assessed. For comparison of two groups, the student- t test was used.

VAS (VISUAL ANALOGUE SCALE) :
It is 10 cm long slide ruler with no pain written at one end and maximum pain at other. The patient slide the cursor along the ruler until it reaches the level that represents the intensity of pain.

DEMOGRAPHIC PROFILE; Our study shows that both the groups were comparable to age distribution. Range in group A was 23-64 yrs with a mean age of 39.67(±8.29) yrs. Range in group B was 25-54 yrs with a mean age of 37.83 (±8.29) yrs. Thus we see that both the groups are comparable in terms of age profile.

ONSET OF SENSORY & MOTOR BLOCAKE.
In our study the mean time of onset of sensory blockade in group A was 180.8 ± 21.39 seconds & in group B 178.07 ± 20.73 seconds, which is statistically not significant (p value > 0.05).

Time in seconds	Group A	Group B
121-150	3	4
151 – 180	12	12
181 – 210	15	13
211 – 240	0	1
241 – 270	0	0
Minimum time	123	134
Maximum time	210	215
Mean time	180.8	178.067
S.D.	± 93.12	± 37.02

In our study,mean time of onset of motor blockade in group A is 231.4 (±27.41) seconds and in group B is 224 .9(±22.32) seconds which is statistically not significant (p value > 0.05)

Time in seconds	Group A	Group B
150 – 180	1	2
181 – 210	7	5
211 – 240	13	16
241 – 270	6	6
271 – 300	3	1
301 – 330	0	0
Minimum time	180	180
Maximum time	300	280
Mean	231.4	224.9
S.D.	±14.72	± 23.22

Finding similar to our study is recorded by Larson et al.3 they studied the effect of addition of clonidine to 4% mepivacaine intrathecally. They divided 60 ASA Grade I & II posted for orthopaedic lower limb surgery in to three groups. One receiving 0.4% mepivacaine 3ml & second 0.4% 3 ml mepivacaine with 75 mcg clonidine and third 0.4% 3 ml mepivacaine with 150mcg of clonidine. No statis-

tically significant difference in onset of sensory and motor blocade is observed between the three groups.

On the contrary studies reported by Hema Saxena et al.4 reported that addition of intrathecal clonidine shortened the onset of sensory blockade in their study. 80 patients of ASA Grade I & II scheduled for below umbilical surgery were devided in to 4 groups. Control group received 13.5 mg 0.5% (H) bupivacaine, study group received clonidine 15 mcg, 30 mcg, 45 mcg respectively. They reported that early onset of sensory blockade was obtained with 37.5 mcg dose of intrathecal clonidine.

Similar finding were also reported in another study by I. Dobrydnjov et al.5 were 45 patients of ASA Grade I & II were devided in to 3 groups. Group B patient received only 6 mg bupivacaine, group BC 15 received 6 mg bupivacaine & 15 mcg clonidine, whereas group BC 30 received 6 mg bupivacaine & 30 mcg of clonidine. I Dobrydnjov concluded that there was significant reduction in the mean time to onset of sensory and motor anaesthesia.

EFFECT ON POST OPERATIVE ANALGESIA

Time in seconds	GroupA	Group B
201 – 250	1	23
251 – 300	4	5
301 – 350	3	2
351 – 400	20	0
401 – 450	0	0
450 – 500	2	0
Minimum time	190	360
Maximum time	305	510
Mean time	237.16	434
S.D.	± 3.53	± 9.04

Our study shows the comparision of duration of post operative analgesia in minutes in patients with intrathecal bupivacaine alone and intrathecal bupivacaine and clonidine. In group A patients total duration of analgesia was 237 (±35.3) mins and in group B 434 (±40.9) mins that statistically significant (p value < 0.05). prolongation of analgesia is observed in group B.

Similar findings of prolonged analgesia with intrathecal clonidine were observed by Grandhe R P et al.6 In their study it was found that patients receiving higher dose of clonidine (1mcg/kg and 1.5mcg/kg) had more prolonged duration of analgesia and lower VAS scores than those receiving lower doses.

Hema saxena et al 4reported duration of sensory block was significantly prolonged in clonidine group. Maximum benefit was seen with 37.5 mcg clonidine dose.

Stephen Stebrel7 et al. reported significantly prolonged sensory and motor blockade in patients after intrathecal clonidine in doses ≥ 75mcg.

Similar finding was also observed by Dobrydnjov et al. 5who reported that cephaled spread of sensory block on dependent side was significantly higher by two to four dermatomes in group BC 15 & group BC 30 patients. In their study VAS score at rest and on movement was significantly lower in group BC15 & group BC30 compared to group B during first 210 mins. The mean time to first request of analgesic was significantly shorter in group B.

Similar findings were also observed by B.S. Sethi et al. 8where significant difference (p value < 0.001) in mean duration of analgesia between the two study groups is observed. Mean duration of analgesia in clonidine group is 614 mins and in bupivacaine alone group is 223 mins. Similarly the no. of injection of diclofenac required in 24 hrs was significantly higher in control group (mean 2.66) than clonidine group (mean 1.16)(p value < 0.005)

I Van Tuiji et al. 9reported that immediate post operative analgesia was better with bupivacaine –clonidine combination intrathecally. This is demonstrated by significantly later first request of analgesia less need for morphine top ups in the recovery period and in lower VAS score.

Niemi et al.10 observed that duration of analgesia was longer in clonidine group (mean 271 mins) than in the control groups (mean 160 mins). Which was statistically very significant.

Requirement of top up injection diclofenac 75 mg im in the post operative period

In our study it is evident that the top up requirement of inj. Diclofenac for pain relief in first 24 hrs was significantly higher in group A (mean of 3.1 ± 2.55) than in group B (mean of 2.2 ± 7.1)

Our findings are consistent with I. Van tuiji et al.9 lowered top up doses of morphine is required in clonidine group in caesarean section and also by B s sethi et al44 in gynaecological surgeries.

CONCLUSION

In conclusion, the addition of intrathecal Clonidine 30 mcg to hyperbaric Bupivacaine prolongs the duration of postoperative analgesia compared to Bupivacaine alone. There was a marked reduction in supplementary rescue analgesic demand in clonidine group.

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