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The Effects of Clonidine with Bupivacaine in Spinal Anaesthesia to Lower Limb Orthopaedic Surgery Cases: A Retrospective Cohort Study

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Abstract: *Neuroaxial Anaesthesia is safe for lower limb orthopaedic surgeries. But duration of sensory and motor block dose not beyond 3 hours with local anaesthetic alone. For prolongation of regional anaesthesia, adjuvants are added to local anaesthetic agents. Clonidine is a frequently used adjuvant to local anaesthetics.*
Objectives: *(1) This study was under taken to assess onset and duration of sensory and motor block. (2) Intra and post operative pain and adverse effects.*
Study Design: *It is retrospective study.*
Study Area: *Government General Hospital, Guntur Medical College, Guntur, AP.*
Study Subjects : *Patients of Lower Limb orthopaedic cases admitted in Govt. General Hospital for Surgery.*
Sample Size: *60 lower limb orthopaedic cases.*
Study Period: *September 2014 to February 2015.*
Methods: *Sixty adult ASA Grade I and Grade II. Patients were matched into two cohorts, study cohort (Bupivacaine with Clonidine) and control cohort (Bupivacaine + 0.5 normal saline) of either sex posted for lower limb orthopaedic surgeries.*
Study Cohort: *3ml of 0.5% Bupivacaine + 30 μg Clonidine.*
Results: *We observed mean duration of motor block significantly higher in study cohort (281.9 ± 1.126) as compared with control cohort (191.03 ± 1.091). Significant difference in duration of sensory block was noted between study cohort (291.4 ± 1.60) and control cohort (181.4 ± 1.054). Duration of Post operative analgesia was significantly higher in study cohort as compared to control cohort.*
Conclusion: *The findings in this study suggested that use of Clonidine 30 μg added to Bupivacaine for spinal anaesthesia effectively increased the duration of motor block and duration of analgesia.*
Keywords: *Spinal Anaesthesia, Bupivacaine, Clonidine.*

I. Introduction

Spinal anaesthesia is frequently used anaesthesia in lower limb orthopaedic surgeries. The advantages of spinal anaesthesia include 1. Quick onset of action 2. Reliability in producing uniform sensory and motor blockade 3. Ease of Administration. Its disadvantage is limited duration of action 2.5 - 3.0 hrs with local anaesthetic alone. Many drugs have been used as adjuvant to enhance the effect of local anaesthetic agents, like adrenaline[1] midazolom [2], opoids [3], neostigmine [4]. Intrathecal clonidine has been extensively evaluated as an alternate to neuroaxial opoid for control pain and has proven to be a potent analgesic. [5]. In our study observed clonide prolongs the sensory blockade [6,7,8] and motor blockade [9,8], reduces the amount or concentration of local anaesthetic required to produce post operative analgesia[6,9]. We observed the degree of sensory and motor block and post operative analgesia provided by low dose (30μg) of intrathecal clonidine admixed with Bupivacaine as compared with Bupivacaine alone in patients undergoing lower limb orthopaedic surgeries.

II. Methods

It is a retrospective cohort study. The patients were matched into two cohorts, study cohort (Bupivacaine with Clonidine) and control cohort (Bupivacaine + 0.5 normal saline). The medical records were reviewed by the authors for study eligibility and following inclusion criteria was taken (1) the study was under taken to assess onset and duration of sensory and motor block. (2) Intra and post operative pain and adverse effects. Clonidine was matched for gender, age, sex, weight and fracture lower limb surgeries performed with 30 patients, who did not used intra operative clonidine dose (1: 1ratio approximately)

Inclusion Criteria:-
1. ASA – I and ASA – II patients
2. Patients aged between 18 and 70 years

Control Cohort received : 0.5% Bupivacaine 3ml + 0.5 ml of Normal Saline
Study Cohort received : 0.5% Bupivacaine 3ml + 30ug of clonidine

The following parameters were observed
1. Time for onset of sensory block
2. Time for onset of motor block
3. Duration of Motor Blockade.
4. Duration of sensory block (Duration of Analgesia)
5. Complications / side effects if any : hypotension, bradycardia, nausea, vomiting, sedation, shivering.

III. Results

Table No. 1 : Patient Demography

Characteristic	Control cohort (Mean ±SEM)	Study cohort (Mean ±SEM)	P value	Significance
Age (years)	51.00 ± 3.207	44.13±3.222	0.1363	Not significant
Weight (Kg)	64.20±1.200	69.43±0.9716	0.0013	Significant
Height (cm)	162.3±1.252	165.1±0.9800	0.834	Not significant
Gender (M:F)	21:9	28:2		

Table No. 2 : Characteristics of Subarchnoid Block

Characteristic	Control cohort (Mean ±SEM)	Study cohort (Mean ±SEM)	P value	Significance
Time of onset of sensory block (min)	4.143 $\pm$ 0.0195	4.200 $\pm$ 0.0234	0.0690	Not Significant
Time of onset of motor block (min)	5.450 $\pm$ 0.411	5.573 $\pm$ 0.0464	0.0517	Not Significant
Duration of motor blockade (min)	191.3 $\pm$ 1.091	281.9 $\pm$ 1.126	<0.0001	Significant
Duration of analgesia (time of first rescue analgesic given (min)	181.4 $\pm$ 1.054	291.4 $\pm$ 1.60	<0.0001	Significant

Table No. 3 : Complications

Complications	Control Cohort	Study cohort
Hypotension	2	4
Bradycardia	0	0
Resperatory depression	0	0
Urinary retention	0	0
Shivering	0	0
Dryness of mouth	4	2

Data & Statistical Analysis:-

A case report form was filled for each included patients with the following data extracted from the medical cohort : Gender, Age, Weight, Height, Diagnosis, Time of onset of sensory block, Time of onset of Motor block, duration of Motor Block, duration of Analgesia and complications / side effects.

The collected data was entered into Microsoft office excel – 2007 and data analysis was performed by using the statistical graph pad prism -6. The analysed data was presented as mean, standard error of Mean, data between control cohort was analysed by using unpaired 't' test, to find out the differences between the two means of Two Cohorts. A p value <0.05 was considered as significant statistically.

Table - I : Demographic characteristics were similar in both cohorts. Male : Female ration observed in control cohort 21:9 and 28 : 2 in study cohort.

Table - II : Shows the onset of sensory block was defined as the time between injection of intrathecal anaesthetic and absence of pain at the T12 dermatome assessed by sterile pin prick every 2 min till T10 dermatome was achieved.

- Time required for onset of sensory and motor blockade was similar in both cohorts. P value shows (>0.05) not significance. The difference in the mean duration of motor blockade among both the cohorts was significant (P < 0.0001). Duration of Motor block was significantly more in study cohort (281.9 $\pm$ 1.126) than control cohort (191.3 $\pm$ 1.091)
- Mean duration of post operative analgesia time was significantly longer in study (291.4 $\pm$ 1.60) cohort than control cohort (181.4 $\pm$ 1.054).
- Table - III shows need of vasopressor was observed in 4 patients of study cohort and 2 patients of control cohort. Dryness of mouth was observed in four patients in control cohort and in 2 patients in study cohort.

IV. Discussion

Lower limb orthopaedic surgeries are preferably done under neuroaxial blockade mainly sub-arachnoid block. Bupivacaine is the standard local anaesthetic agent for sub-arachnoid block for these surgeries, for prolongation of regional anaesthesia, adjuvants are added to local anaesthetics like opoids, α agonists, epinephrine etc. Clonidine is alpha – 2 adrenergic agonist, it has been shown to be of benefit for use in central neuroaxial blocks and regional blocks by Increasing and duration and intensity of pain relief,[8] as also by decreasing the systemic and local inflammatory stress response. Mechanism of prolonged motor and sensory block by clonidine is not well known. It produces analgesia by depressing the release of C-fiber transmitters and by Hyperpolarization of post synaptic dorsal horn neurons[9]. Binding of clonidine to motor neurons in the dorsal horn may prolong motor block. Its effect in terms of potentiation of sensory and motor block of Intrathecal bupivacine has been studied with doses of 1 -2 μg/kg [10]. Does much less than 1μg/kg have shown contradicting results in terms of Augmenting the effects of local anaesthetics, but with minimal side effects in Adult patients. [11,12,13]

There was no significant difference found between patient characteristics (Age, weight, Height, Gender) in this study Characteristics of subarachnoid block, time required for onset of sensory and motor blockade was similar in both cohorts. Control cohort (4.143 $\pm$ 0.0195 & 5.450 $\pm$ 0.411) and study cohort. (4.200 $\pm$ 0.023 & 5.573 $\pm$ 0.0464)The difference in the mean duration of motor blockade among both cohorts was significant control cohort (191.3 $\pm$ 1.091) and study cohort (281.9 $\pm$ 1.126)

Mean time for post – operative analgesia was significantly longer in study cohort. (291.4 $\pm$ 1.60) than control cohort (181.4 $\pm$ 1.054). Van TUIJL et al used low dose of Intrathecal clonidine (15, 30 μg) with satisfactory outcome. And there was no significant difference in the sensory block levels. In our study hypotension noted with clonidine 30μg + bupivacine 15mg, but not much.

Three studies conducted with Isobaric bupivaciane and clonidine reported no significant hypotension. The doses used were 75 and 100μg clonidine with 13.75 mg Bupivacaine [14] and 150 μg clonidine with 15 mg of bupivacaine. Klimscha et al [15] have reported a significant fall of mean arterial blood pressure and heart rate after intrathecal injection of 150 μg clonidine and 5 mg of isobaric bupivacaine. These authors argued that the hypotension effect of clonidine was revealed because a low dose of bupivacaine was used.

De Kock et al [16] recommended a dose of 15-45μg of clonidine as optional for supplementing spinal anaesthesia. Saxena et al [17] in a study aimed to evaluate the lowest dose of intrathecal clonidine as adjuvant to hyperbaric bupivacaine that would produce maximum benefit with minimum side effects. Which is similar to our study.

V. Conclusion

We observed that addition of clonidine 30 μg to bupivacaine for spinal anesthesia, can prolong the sensory and motor blockade and duration of analgesia without much adverse effects.

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