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"Efficacy of Intrathecal Dexmedetomidine and Fentanyl as Adjuvants To 0.5% Hyperbaric Bupivacaine in Spinal Anaesthesia"

KEYWORDS : α2, adrenoreceptor agonists, bupivacaine, fentanyl, spinal anaesthesia.

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ABSTRACT *To compare the effects of intrathecal dexmedetomidine and fentanyl as adjuvants to hyperbaric bupivacaine with a control group with regards to time of onset of sensory and motor blockade, Duration of sensory blockade and motor blockade, Two segment sensory regression time, Duration of effective post- operative analgesia and incidence of side effects. A randomized, prospective study, after obtaining ethical committee approval in Asram hospital and written informed consent of patients was conducted on 100 Adult Patients of either sex, aged between 20 to 45 years, of physical status ASA Grade I and Grade II undergoing elective lower limb surgeries under spinal anaesthesia. Patients were divided into 2 groups of 30 each. Group D received 15mg hyperbaric bupivacaine with 10mcg dexmedetomidine. Group F received 15mg hyperbaric bupivacaine with 25mcg fentanyl. The time of onset of sensory and motor blockade and the duration of two segment sensory regression time, sensory, motor blockade and duration of effective post op analgesia was statistically significant in group D compared to F. Intrathecal Dexmedetomidine is associated with faster onset of sensory and motor blockade, with significantly prolonged sensory and motor blockade and less requirement of rescue analgesia compared to fentanyl.*

Introduction

Spinal anaesthesia is a simple technique which is easier to perform with rapid onset of anaesthesia, providing adequate analgesia both intra operatively and post operatively. Spinal anaesthesia can be provided with a wide range of local anesthetics and additives that allow control over the level, time of onset and duration of spinal anaesthesia. Postoperative pain control is a major problem, as using only local anesthetics is associated with relatively short duration of action and thus early analgesic intervention is needed in the postoperative period. A number of adjuvants, such as clonidine, midazolam, and others have been studied to prolong the effect of spinal anesthesia. Opioids produce intense and prolonged analgesic action without gross autonomic changes, loss of motor power or impairment of sensation other than pain when injected into subarachnoid space.

Fentanyl a highly lipophilic opioid has rapid onset of action and lesser side effects. Duration of ef-fects of intrathecal fentanyl is dose independent. Side effects include pruritus, nausea and vomiting and rarely serotonin syndrome. Recently intrathecal administration of α-2 adrenoreceptor agonist as adjuvants to local anaesthetics has shown to have sedative, analgesic, hemodynamic stabilizing ef-fect with prolonged duration of spinal block. It's a highly specific, selective α-2 adrenoreceptor ag-onist with 8 times more affinity for α-2 adrenoreceptors than clonidine. Based on earlier human studies, it is hypothesized that intrathecal 10 μg dexmedetomidine would produce more postopera-tive analgesic effect with hyperbaric bupivacaine in spinal anaesthesia with minimal side effects. Till date, there are only few studies done that compare the effects of addition of 10 μg dexmedetomi-dine to hyperbaric bupivacaine and 25 μg fentanyl to hyperbaric bupivacaine.

Methodology

This study was conducted on patients admitted to ASRAM Medical College,Eluru. After obtaining institutional ethical committee approval and written informed consent, this prospective randomised controlled single blind study was conducted on 100 patients for following elective lower limb pro-cedure. Inclusion criteria were patients undergoing lower limb procedures, aged between 18 to 65 years of American Society of Anesthesiologists (ASA) physical status I or II. Exclusion criteria were patient in whom subarachnoid block is contraindicated, with uncontrolled, labile hyperten-sion, uncontrolled diabetes, with history of allergy to study drug, patient with communication diffi-cult that would prevent reliable post operative assessment, with mental illness, poly trauma patients, patients who are already on alpha 2 agonists.

After obtaining informed written consent and confirming recommended NBM status the patients were wheeled in to the operating theatres.All the patients were given anti emetics and H2 prophy-laxis.no sedativee or analgesic premedication was administered.Patients were briefed about the pro-cedure and the visual analogue pain scale(VAS:0-NO PAIN,10-WORST PAIN EVER)during the pre anaesthetic checkup and also in the operating room pre-operatively.

Under all aseptic precautions, venous access is obtained in the dorm of the non-dominant hand with 18G cannula and infusion of crystalloid was commenced. The patient was then placed in the sitting position with some flexion to open the intervertebral spaces.Using 25G quincke spinal needle, spinal block was performed at level of L3-L4 through a midline approach and patient put to supine posi-tion. Patients in group D received 3ml of 0.5% hyperbaric bupivacaine with 10mcg dexmedetomi-dine.Patients in group F received 3ml of 0.5% hyperbaric bupivacaine with 25mcg fentanyl.The time at intrathecal injection was considered as 0 and the following parameters were observed, time of onset of sensory blockade, the height of sensory blockade, motor blockade as per Bromage Scale, total duration of sensory blockade, quality of analgesia, two segment sensory regression time, need for rescue analgesia when patient complains of pain and incidence of side effects.

Statistical analysis:

A Comparative two group randomised clinical study with 100 patients with 50 patients in group F(Fentanyl) and 50 patients in group D(Dexmedetomidine) is undertaken to study in hemodynamics and side effects.

Statistical analysis was done by applying chi-square test, Anova test and students 't' test to analyse the data, p value was determined.

P > 0.05 is not significant
P < 0.05 is significant
P< 0.001 is highly significant

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Results

There was no significant difference in the patient characteristics in terms of age, sex, weight or height distribution.

Comparison of Time of Injection to T10, Highest sensory level, onset of Bromage 3 and regression to Bromage 0 :

variables	Group F	Group D	P value
Time from injection to T10 (minutes)	3.38±0.83	2.62±0.56	<0.001
Time from injection to higest sensory block (minutes)	11.47±1.23	11.72±1.23	0.314
Onset of Bromage 3 (MInutes)	10.38±1.08	10.59±1.00	0.317
Regression to bromage 0 (minutes)	152.90±8.31	419.70±16.85	<0.001

Time from injection to T10 :

The time taken from injection to reach T10 in group F is 3.38±0.83 minutes, 2.62±0.56 Minutes in group D and 283.17±47.60 seconds in group F.Group D and F are statistically Significant with p-value <0.001.

Regression to Bromage 0:

The time take to regression level to bromage 0 in group f is 152.90±8.31 minutes,419±16.85 minutes in group D. Group D and F statistically Significant with p-value <0.001.

Side Effects of the patients in two groups :

Side effects	Group F	%	Group D	%
Hypotension	8	16	14	28.0
Bradycardia	0	0	7	14.0

During the procedure we observed bradycardia in Group D in 7 patients (14%) and was successfully treated with vagolytic agents. Whereas in Group D it twas observed that there was hypotension in 14 patients (28%) and was successfully treated with vasopressors..

Intraoperatively sedation score was assessed using Modified Ramsay Sedation Scale and there was higher incidence of sedation with Dexmedetomidine group. Regression of motor block to Bromage 0 was observed and the time to regression was significantly prolonged to 419.70±16.85 in the Dexmedetomidine group while it was 152.90±8.31 in the Fentanyl group.

Discussion

The mechanism by which intrathecal alpha-2 adrenoreceptor agonists prolong the motor and sensory block of local anaesthetics is not well known.They act by binding to presynaptic C-fibres and post synaptic dorsal horn neutrons.Their analgesic action is a result of depression of the release of C- fibres transmitters and hyperpolarization of postsynaptic dorsal horn neutrons.Local anaesthetics act by blocking sodium channels.The prolongationn of effect may result from the binding of alpha-2 adrenoreceptor agonists have been found to have antinociceptive action for both somatic and visceral pain.

Studies using a combination of intrathecal dexmedetomidine and local anaesthetics are lacking.In our, the intrathecal use of dexmedetomidine selected was based on previous studies.

Fukushima et al administered 2 mcg/kg epidural dexemedetomidine for postoperativeve analgesia in humans but did not report any neurological deficit with its use.Our study has shown that the addition of 10mcg dexmedetomidine with hyperbaricc bupivacaine significantly prolongs both sensory and motor block. Dexmedetomidine provided good quality intraoperative analgesia and hemodynamic stability. Small doses of intrathecal dexmedetomidine (3mcg) used in combination with bupivacaine in humans have shown to shorten the onset of motor block and prolong the duration of motor and sensory block with hemodynamic stability and lack of sedation.

Al-Ghanem et al had studied the effect of addition of 5mcg dexmedetomidine or 25mcg fentanyl intrathecal to 10mg isobaric bupivacaine in vaginal hysterectomy and concluded that 5mcg dexmedetomidine produces more prolonged motor and sensory block as compared with 25mcg plain bupivacaine.

In our study, in the dexmedetomidine group we found longer duration of both sensory and motor blockade, stable haemodynamic condition and good patient satisfaction.

Conclusion

Addition of 10mcg Dexmedetomidine with hyperbaric bupivacaine significantly prolongs both sensory and motor block.

Intraoperatively,there was less incidence of side effects with intrathecal dexmedetomidine then compared to intrathecal fentanyl.

To conclude,10mcg dexmedetomidine seems to be an attractive alternate to 25mcg fentanyl as an adjuvant to spinal bupivacaine in surgical procedures.It provides good quality of intraoperative analgesia,hemodynamic stability and minimal side effects and excellent prolonged postoperative analgesia.

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