



Comparative Study Between Dexmedetomidine Given Intrathecally And Fentanyl In Abdominal Surgeries

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Abstract

Background : Local anaesthetic agents like bupivacaine heavy are routinely used for spinal anaesthesia. Adjuvants like fentanyl clonidine dexmedetomidine are used to enhance the duration of motor and sensory blockade. In our study we have compared Fentanyl and Dexmedetomidine

Material And Methods: 60 patients were included in our study. They were divided in two groups of 30 each . Group A received Hyperbaric Bupivacaine 12.5 ml + 25 mcg Fentanyl. Group B received hyperbaric Bupivacaine 12.5ml + 5 mcg dexmedetomidine. The motor and sensory blockade was assessed in these patients.

Results And Conclusion: From our study we could conclude that 5 mcg of dexmedetomidine can be a good alternative to 25 mcg fentanyl as a adjuvant in spinal anaesthesia.

Keywords: Dexmedetomidine, fentanyl, adjuvant, hyperbaric bupivacaine

Introduction

Bupivacaine is commonly used in spinal anaesthesia but the duration of action and effect of motor and sensory blockade can be of short duration, if adjuvants like clonidine, fentanyl ,dexmedetomidine are not used .Higher doses of Bupivacaine have to be used for adequate motor and sensory blockade if adjuvant is not used which can again lead to cardiotoxicity. The addition of fentanyl to hyperbaric bupivacaine has added advantage of good quality of intraop and reduction in post operative analgesia. Dexmedetomidine a new highly selective alpha 2 agonist can be used as a neuraxial adjuvant as it provides better hemodynamic stability with good intraoperative and postoperative analgesia with minimal side effects. Dexmedetomidine has been approved by food and drug administration as a short term sedative for ICU patients. According to previous studies 5mcg of intrathecal dexmedetomidine would produce more postoperative analgesia with hyperbaric bupivacaine in spinal anaesthesia with

minimal side effects. The present study is conducted to evaluate and compare the effects of fentanyl and dexmedetomidine as intrathecal adjuvant to hyperbaric bupivacaine.

The aim of our study was to compare the Onset of motor and sensory blockade with fentanyl and dexmedetomidine along with the hemodynamic stability and post operative analgesia

The primary objective was to evaluate and compare the effects of fentanyl and dexmedetomidine on time of request of first dose of rescue analgesia. The secondary objective was to compare the effect of dexmedetomidine and fentanyl on time of onset and duration of sensory and motor blockade, hemodynamic status and side effects.

Materials And Methods :

The study was conducted from the period of January 2022 to June 2022.The study was conducted after approval from the institutional ethical committee.

Written informed consent was obtained from the patients for conducting the study and for later publication of the same study. Inclusion criteria were patients who belonged to American society of anaesthesiologist class I and II, either sex, age 18-65 years presenting for lower limb surgeries. Exclusion criteria were the patients allergic to drug, dysrhythmia or on therapy with adrenergic receptor antagonist, calcium channel blocker and/or ace inhibitor, patients with neurological disorders, infection at puncture site, spine deformity. 60 patients were included in the study. They were divided in two groups of 30 each using a computer generated program. Assigned random group was enclosed in a sealed envelop to ensure the concealment of allotment. The anaesthesiologist who was not included in the study opened the envelope and prepared the drug accordingly. Group A received hyperbaric bupivacaine 12.5ml + 25 mcg fentanyl and Group B received hyperbaric bupivacaine 12.5mg + 5mcg dexmedetomidine which was administered intrathecally. Preanaesthetic check-up was done and visual analog scale was explained to the patients. All patients were kept nil orally 6 hours prior to the surgery. In the preop area iv cannula was inserted and the patient was shifted inside the operation theatre. Patients were preloaded with ringer lactate solution at 10ml/hr. Preoperative parameters like pulse blood pressure saturation was noted. Under all aseptic precautions spinal anaesthesia was administered at level of L3 -L4 space with 25 g Quincke spinal needle. Pulse rate, Respiration rate, SPO₂, Electrocardiogram and Blood pressure were monitored. Pulse rate and Blood pressure variation were noted in each groups which were more than 20%. Bradycardia and hypotension were treated with iv Atropine and

Mephentermine. Sensory and Motor block was monitored every 2,4,6,8,10,15 mins. Sensory block was assessed by loss of pinprick sensation to 23G hypodermic needle and dermatome levels were tested every 2 mins till desired level of blockade was achieved for surgery. The motor blockade was assessed by Modified Bromage scale. Bromage

0: patient able to move hip knee and ankle. Bromage 1: patient unable to move hip but able to move knee and ankle. Bromage 2: patient unable to move hip and knee but able to move ankle. Bromage 3: patient unable to move hip knee and ankle. Duration of sensory block was taken as time from maximum height of the block till regression to level 1. The onset of motor blockade was defined as time from intrathecal injection to motor blockade level 2 in Bromage scale. Any side effects which included pruritus, pain, shivering, sedation, hypotension were noted. Patients were assessed for the degree of sedation and scoring was done according to Campbell sedation score as 1: wide awake 2: awake and comfortable 3: drowsy and difficult to arouse 4: not arousable. Post operatively the pain score was recorded using Visual Analog Scale [VAS] between 0 and 10 [0=no pain 10=severe pain]. Injection Paracetamol was given as a rescue analgesic when VAS >5.

To calculate the sample size, a power analysis of $\alpha=0.05$ and $\alpha=0.90$, showed 30 patients per group study were needed. Data are expressed either as mean and standard deviation or as numbers and percentage. Continuous covariates were compared using analysis of variance [ANOVA]. The comparison was studied using Chi-square test or Fisher's exact test as appropriate. With P value reported at 95% confidence interval. $P < 0.05$ was considered statistically important.

Results:

In our study we observed that the demographic data [age, weight, height, ASA grade, gender and duration of surgery] were comparable with $P > 0.05$ which is statistically not significant.

Similarly in our study there is no statistically significant difference in hemodynamic parameters [blood pressure and heart rate] is observed in both groups. Hypotension is not observed in any of the two groups. Incidence of bradycardia was similar in two groups and only 2 patients in group B developed bradycardia requiring treatment with atropine.

Table 1 :Demographic data

<i>Characteristics</i>	Group A [n=30]	Group B [n=30]
Age in years	42.53 \pm 15.43	44.76 \pm 14.20
Height	154 \pm 9.54	153.25 \pm 8.59
Weight in kg	64.54 \pm 12.50	61.80 \pm 8.38
Sex [male:female]	16:18	18:16
ASA grade	1-2	1-2
Duration of surgery	120.47 \pm 54.63	128.65 \pm 7.10

Values are in mean \pm sD, P>0.5 not significant ASA :American Society of anaesthesiologists, SD Standard Deviation

Table 2 compares the onset of duration of sensory and motor block and duration of postoperative analgesia weaning of and need of rescue analgesia. Both groups were comparable in terms of onset and offset of sensory and motor blockade. The time of rescue analgesia was prolonged in Group B with dexmed [251.92 \pm 30.69] as compared to fentanyl in Group A. There is no much significant difference in onset in sensory and motor blockade in Group A and Group B

Table 2 :Comparison of blockade [onset and regression of sensory and motor block]

Parameters	Group A	Group B [dexmed] n=30	P
	[fentanyl] n=30		
Time in min for onset of sensory blockade	1.47 \pm 0.19	1.19 \pm 0.38	0.034
Time in min for onset of motor blockade	1.62 \pm 0.45	1.02 \pm 0.49	0.44
Time in min for peak of sensory blockade	7.34 \pm 0.96	7.56 \pm 1.78	0.94

Two segment regression time in min for sensory blockade	132+_14.56	136.56+_12.6	0.35
		7	
Time in min for weaning offers motor block	172.19+_28.6	190.31+_24.0	<0.001
	5	7	
Time in min	169.96+_15.9	251.92+_30.6	<0.001
for first dose rescue analgesia	6	9	

Values are in mean+_SD SD :standard deviation

Sedation was more in group B as compared to Group A. Two patient had bradycardia in group B but was managed with Inj Atropine 0.6mg IV.No patient had residual neurologic defects postdural puncture headache or other transient neurologic symptoms

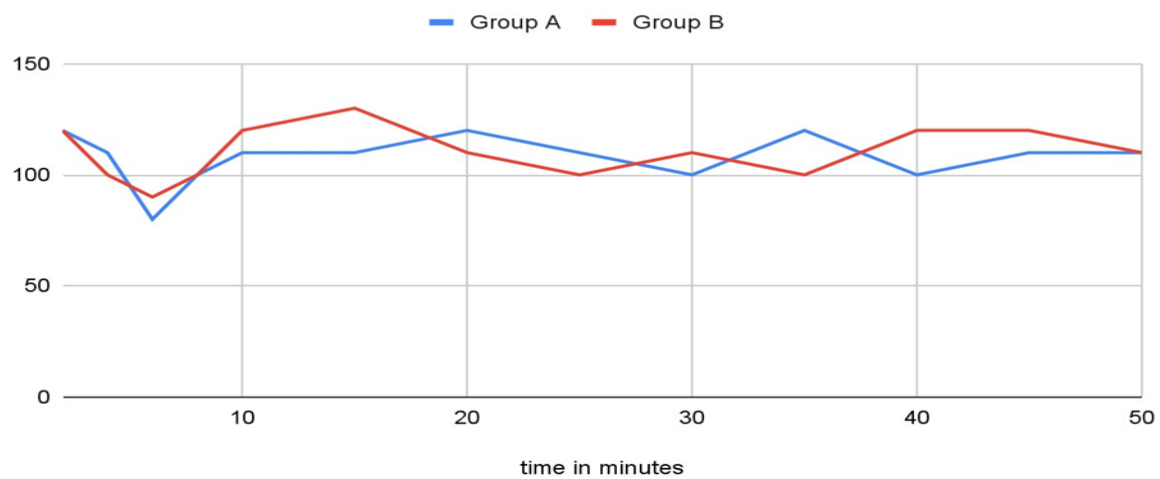
Table 3:Campbell sedation score:

Sedation Score	Group A [Fentanyl] n=30	Group B [Dexmed] n=30
Wide awake	28	5
Awake and comfortable	2	27
Drowsy and difficult to arouse	0	0
Not arousable	0	0

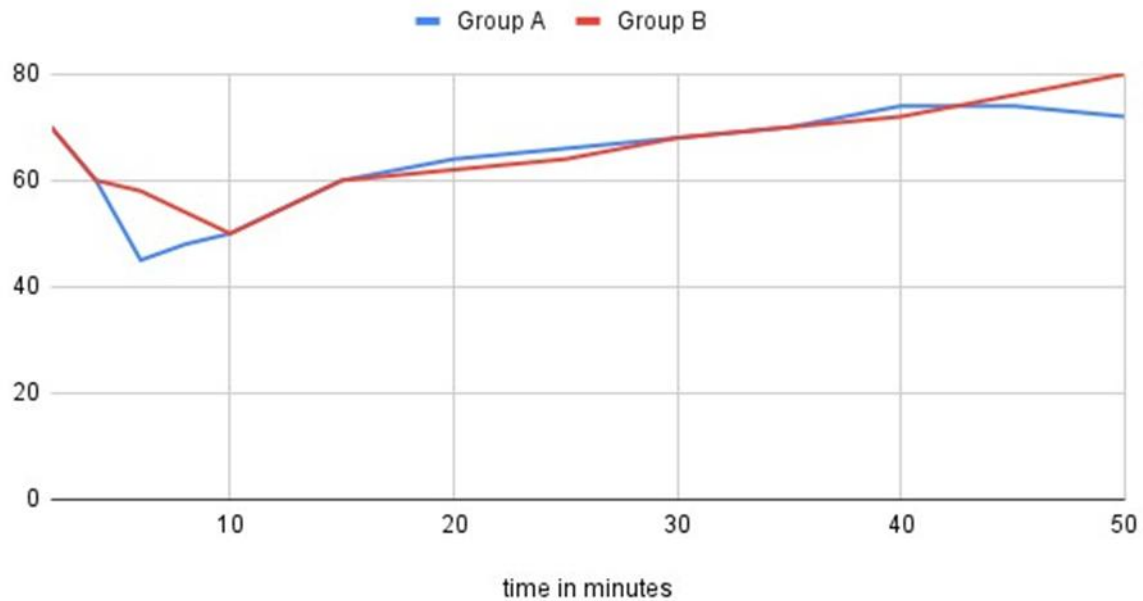
Table 4 :Other complications and side effects:

Side Effects	Group A [fentanyl]	Group B [Dexmed]
Pruritus	0	0
Nausea	1	0
Vomiting	0	0
Hypotension	0	0
Bradycardia	0	2
Respiratory depression	0	0
Shivering	6	5

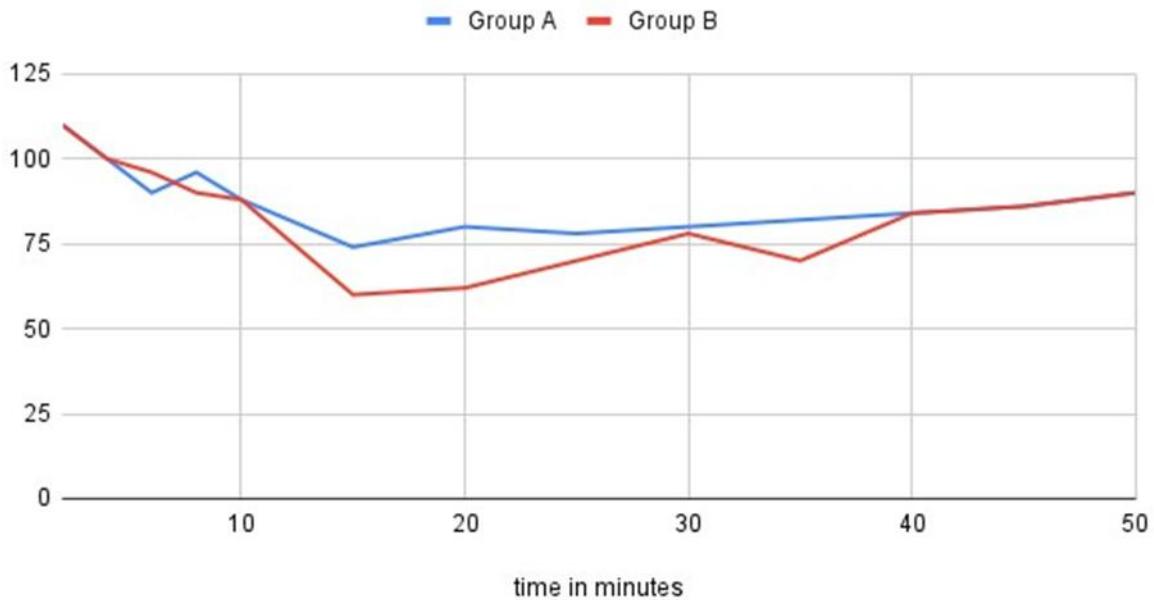
Change in systolic blood pressure [mmHg]



changes in Diastolic blood pressure



changes in Heart rate



Discussion:

The exact mechanism by which the intrathecal administration α_2 adrenoceptor agonists prolong the motor and sensory block of local anaesthetics is not well known. The analgesic action of α_2 adrenoceptor agonists is a result of depression of release of C fibre

transmitters and hyperpolarization of postsynaptic dorsal horn neurons.[9].The local anaesthetics act on sodium channel receptors. The prolongation of effect can be due to synergism between local anaesthetics and α_2 adrenoceptor agonists and motor blockade due to binding of α_2 adrenoceptor agonists to the motor neurons in the dorsal horns[10].Fentanyl being a

lipophilic μ receptor agonist exerts the effect by combining with the opioid receptor in dorsal horn of spinal cord and spreads in supraspinal region. Studies using combination of dexmedetomidine with intrathecal local anaesthetics are very few. Our study was based on use of intrathecal dexmedetomidine in animal studies [12] which showed that 25mcg to 100mcg of intrathecal dexmedetomidine had not reported any neurological deficits with further use [13-17]. Al-Ghanem et al had studied the effect of addition of 5mcg dexmedetomidine or 25mcg fentanyl intrathecal to 10mg Inj bupivacaine heavy in vaginal hysterectomy produces more prolonged sensory and motor blockade as compared with 25mcg fentanyl [5]. Al-Mustafa et al studied the effect of 5mcg and 10mcg of dexmedetomidine with bupivacaine in urological procedures and found that dexmedetomidine prolongs the duration of spinal anaesthesia in dose dependant manner [6]. In our study we found that the duration of sensory and motor blockade was prolonged in the dexmedetomidine group.

Fukushima et al administered epidural 2mcg/kg of dexmedetomidine in humans but did not report any neurologic deficits. [18] Small doses of dexmedetomidine intrathecally ie 2.5-5 mcg used in combination with bupivacaine heavy in humans have shown to shorten the onset of motor and sensory block and prolong the effect of sensory and motor block with hemodynamic stability and lack of sedation. [7] In our study the analgesia was better in Group B which received dexmedetomidine intrathecal but was not statistically significant. Motor and sensory block was prolonged which was significant [P>0.001] in our study.

In our study hypotension was more in dexmedetomidine group than fentanyl group, but was not statistically significant. The α_2 adrenergic agonists also have anti shivering property as observed by Talke et al [20]. We also did not find incidence of shivering in our study group.

In our study we found at 2 hours mean VAS score was

2.60 \pm 0.84 in group A [fentanyl], 0.45 \pm 0.68 in group B [dexmed]. At 3 and 4 hours mean VAS score was significantly lower in Group B [0.13 \pm 0.33, 0.45 \pm 0.78] than Group A [0.95 \pm 0.88, 1.35 \pm 0.86]. Our studies are comparative

with the studies conducted by Chandrashekharrappa et al and Abdel Hamid et al [21]

Conclusion

From our study we can conclude that 5mcg dexmedetomidine can be a good alternative to 25mcg fentanyl as adjuvant to spinal bupivacaine in surgical procedure since it provides good quality of intraoperative analgesia, hemodynamically stable conditions for surgical procedures with minimal side effects and excellent quality of post operative analgesia.

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