Block Characteristics and hemodynamic parameters following intra-thecal Hyperbaric 0.5% Bupivacaine with Dexmedetomidine and Hyperbaric 0.5% Bupivacaine alone in lower abdominal Surgeries

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ABSTRACT

Introduction: Spinal anaesthesia is a commonly used technique in anaesthetic practice for gynaecological, lower abdominal, pelvic, and lower limb surgeries. Spinal anesthesia is commonly used for surgery because of ease of administration. The Objective of this manuscript mainly focused the comparative evaluation of block characteristics and hemodynamic parameters following intrathecal hyperbaric 0.5% bupivacaine with dexmedetomidine and hyperbaric 0.5% bupivacaine alone in lower abdominal surgeries. **Methods:** A total of 100 patients of surgery were randomly assigned in two groups. Group A– Patients who had received 3.0 ml of 0.5% Bupivacain (Heavy)+0.5 ml normal saline and served as control group. Group B– Patients who were administered 3.0 ml of 0.5% Bupivacaine (Heavy) mixed with 5µg Dexmedetomidine (0.5 ml). All patients included in the study were normotensive and had no co-morbid medical disease condition and normal preoperative investigations belong to ASA I & II grade. Patients were observed for block characteristics, hemodynamic, occurrences of side effects and adverse reactions. **Results:** The regression of the sensory block to S1 dermatome and duration of motor block were affected by the addition of Dexmedetomidine to the spinal bupivacaine. Onset of sensory block at T8 and motor block at bromage 3 were statistically significant between group A and group B. Intraoperative no significant differences in mean systolic BP and diastolic BP between two groups, maximum lowering in heart rate occurred in group B. **Conclusion-** Dexmedetomidine a newer Alpha 2 agonist seems to be an attractive adjuvant to spinal Bupivacaine even in doses as low as 5 µg. Dexmeditomedine provides longer duration of sensory and motor block without increasing the incidence of significant adverse effects. It provides prolonged sensory and motor blockade, haemodynamic stability, and excellent intraoperative analgesia.

Key words: Dexmedetomidine, hyperbaric 0.5% bupivacaine, intrathecal

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INTRODUCTION

Spinal anesthesia is a commonly used technique in anaesthetic practice for gynaecological, lower abdominal, pelvic, and lower limb surgeries. Spinal anesthesia is commonly used for surgery because of ease of administration.

Bupivacaine, a pipecoloxylidide derivative synthesized in 1957 by Ekenstam and introduced in clinical practice in 1963. It is a racemic mixture of D and L isomers and is relatively more cardiotoxic compared to other local anaesthetics[1-8].

As such single shot spinal anaesthesia still remain a popular form of anaesthesia, being most simple and easy to administer and produces sufficient analgesia with sufficient surgical muscle relaxation, causes minimal blood loss from operative field, economically cheapest with least morbidity and mortality. Bupivacaine is appropriate for procedures lasting for 2 to 3 hours. If the duration of surgery prolongs it may have to be converted into general anaesthesia or supplemented with an intravenous anaesthetic agent. To overcome this adjuvants like epinephrine, phenylephrine, adenosine, magnesium sulphate, sodium bicarbonate, neostigmine and alpha2 agonists like clonidine, dexmedetomidine have been used intrathecally[9,10]. They produce sedation and anxiolysis by binding to presynaptic alpha2 receptors in locus ceruleus. Post synaptic activation in CNS inhibits sympathetic activity thus decreasing heart rate and blood pressure[11]. In the spinal cord stimulation of alpha2 receptors at the substantia gelatinosa of the dorsal horn leads to inhibition of the firing of nociceptive

neurons and inhibition of the release of substance P contributing to their analgesic action[12].

Dexmedetomidine is a suitable adjuvant to spinal anaesthesia. It has sedative and analgesic effects due to its more selective alpha 2A receptor agonist activity[13]. The stable hemodynamic and the decreased oxygen demand due to enhanced sympatho adrenal stability make this agent very useful pharmacologic agent for preoperative patient care. Bolus dose of alpha 2 agonists is associated with side effects like hypotension and bradycardia[14].

This study is designed to evaluate the effects of Dexmedetomidine on duration of analgesia, block characteristics and the intraoperative hemodynamic profile when mixed with Bupivacaine.

MATERIAL AND METHODS

After approval from institution ethical committee, written informed consent was obtained from patients. Study was conducted on 100 patients of surgery who were randomly divided into two groups (50 patients in each groups).Group A–Patients who had received 3.0 ml of 0.5% Bupivacain (Heavy) + 0.5 ml normal saline and served as control group. Group B – Patients who were administered 3.0 ml of 0.5% Bupivacaine (Heavy) mixed with 5µg Dexmedetomidine (0.5 ml). All patients included in the study were normotensive and had no co-morbid medical disease condition and normal preoperative investigations belong to ASA I & II grade. Patients were observed for block characteristics, hemodynamic, occurrences of side effects and adverse reactions.

The patients were explained about the spinal technique. They were nil per orally from 10 pm onwards of the previous night of surgery. All the patients were pre-medicated with tablet alprazolam 0.5 mg and ranitidine 150 mg on the night before surgery. Patients were cannulated with an 18 gauge cannula for fluid administration, and monitoring device was attached to record heart rate, electrocardiogram (ECG), pulse oximetry (SpO2), non invasive blood pressure (NIBP). Patient was made to sit for administration of block. . Back of the patient was prepared with a solution of povidone iodine and sprit. In midline approach, 25 gauge Quincke needle was placed in the L3-L4 interspace.

The drug was injected after confirming the free flow of CSF. Following the injection, the needle was removed and the patient was placed in supine position. Intraoperatively, the pulse rate, respiratory rate, blood pressure, SPO2, sensory and motor blockade level were monitored and recorded until the end of the surgery. Observation recorded in regards to time of onset for sensory block, time of onset of motor block, highest level of sensory block achieved (by pin prick method), duration of sensory block, duration of motor block, intraoperative muscle relaxation (on Bromage scale), Any complication like bradycardia, hypotension, respiratory depression.

Statistical Analysis: The two groups were compared for their efficacy to achieve maximum sensory and motor blockage, time taken to achieve designated level of blockage, success in achieving designated level of blockage. Analysis was performed using SPSS Software. Data were expressed as mean, standard deviation. A P value < 0.05 was considered statistically significant.

RESULTS

A total of 100 patients were enrolled in the study. All the patients completed the study protocol and were included in the data analysis. Group A consisted of 50 patients and group B of 50 patients. There was no significant difference in the demographic data between the two groups ($p > 0.05$). The time to reach T8 dermatome and onset of motor block at bromage scale 3 were recorded and statistically comparable ($p > 0.05$) among two study groups. The regression of the sensory block to S1 dermatome and duration of motor block were affected by the addition of Dexmedetomidine to the spinal bupivacaine.

Table 1: Demographic profile and anthropometric measurement of the patients (N=100)

Variables	Category	Group A(n=50) (mean±SD)	Group B(n=50) (mean±SD)	P value
Age(yrs)		43.18 ± 10.79	42.34 ± 11.56	>0.05
Height (cms.)		164.90 ± 7.77	164.64 ± 7.49	>0.05
Weight (kgs.)		55.0 ± 6.69	55.6 ± 6.40	>0.05
		A Frequency	B Frequency	
Sex	Male	22	23	>0.05
	Female	28	27	

Table 2: Group wise frequency with percentage of types of surgeries, the nature of surgeries in 100 patients

Sl. No.	Surgeries	Group A(n=50) Frequency (%)	Group B(n=50) Frequency (%)
1	Abdominal hysterectomy	12(24%)	8(16%)
2	Prostatectomy	8(16%)	7(14%)
3	Appendectomy	7(14%)	10(20%)
4	Inguinal hernia repair	8(16%)	8(16%)
5	Vaginal hysterectomy	9(18%)	10(20%)
6	Ovarian cystectomy	6(12%)	7(14%)
	Total	50(100%)	50(100%)

Table 3: Comparison of sensory and motor blockade in both groups (N=100)

Different onset (minutes)	Group A(n=50) (mean±SD)	Group B(n=50) (mean±SD)	P value
Onset of sensory block at T8	7.30 ± 0.90	5.18 ± 0.77	0.001
Highest level of sensory block (T)	5.28 ± 0.92 (T)	5.26 ± 0.94(T)	0.91
Onset of motor block	8.46 ± 0.67	6.92 ± 0.8	0.001
Time of sensory regression to L1	150.00 ± 6.51	189.42 ± 8.67	0.0001
Time of sensory regression to S1	209.89 ± 14.45	275.50 ± 15.36	0.0001
Duration of motor block	180.50± 10.14	220.80 ± 11.57	0.0001

Above table3 shows the average time (minutes) of onset of sensory block at T8 in group B is less than the Group A. It is also statistically significant difference (p=0.001). However, average time to reach highest level of sensory block (T) is almost similar in both groups. Average time (minutes) of onset of motor block is significantly less in group B as compared with group B (P=0.001). Average time (minutes) of sensory regression to L1 & S1 and duration of motor block are significantly prolonged in Group B as compared to Group A (P=0.0001).

The mean heart rate of patients at preoperative was 78.0 ± 7.09 and 79.32 ± 7.46 in patients of Group A and Group B respectively. Maximum lowering in heart rate occurred in group B (90min-120min) (Figure 1)

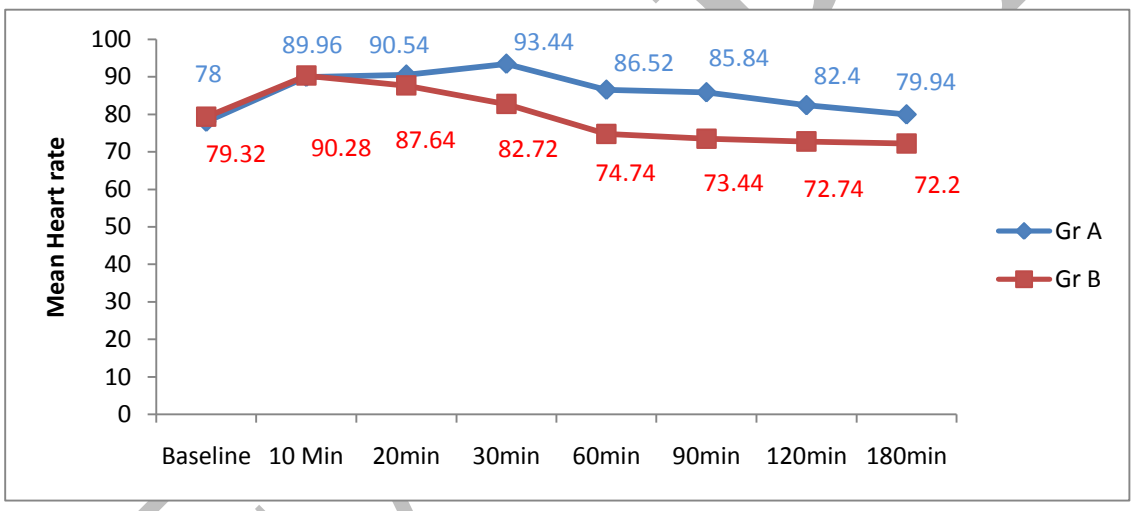

Figure 1: Bar graph showing the mean heart rate in different time interval in both groups

Group A baseline mean systolic BP was 122.7 ± 8.39 mm Hg, whereas in Group B it was 123.76 ± 7.97 mm Hg. After 180 min mean systolic B.P was 120.62 ± 5.08 in group A and 121.16 ± 5.07 in group B. There was no significant difference in mean systolic BP between two groups in different time interval.

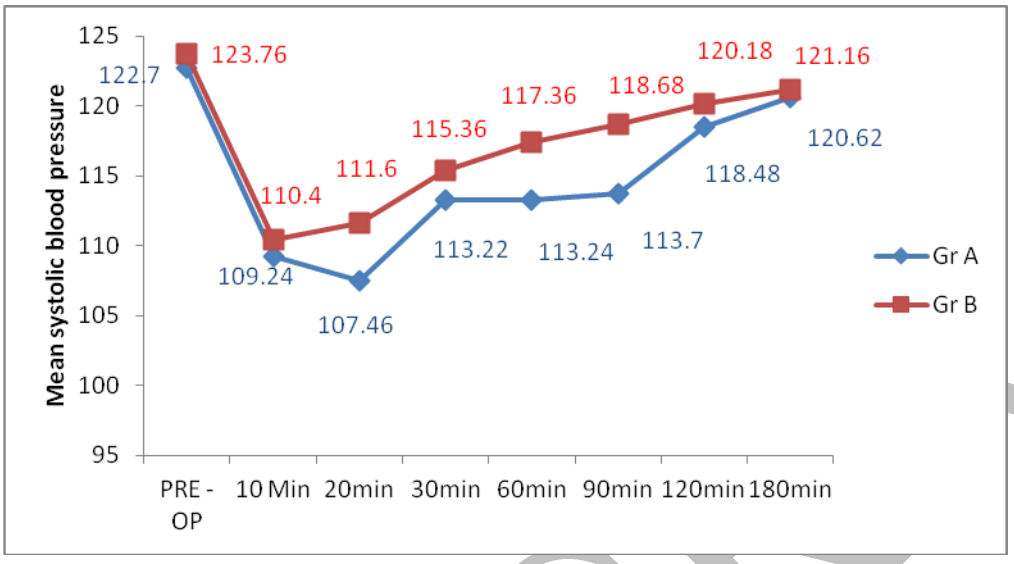

Figure 2: Bar graph showing the mean systolic blood pressure (mm Hg) in different time interval in both groups

Group A mean diastolic BP (baseline) 76.24 ± 8.67. Group B mean diastolic BP (baseline) 76.04 ± 6.84.Mean diastolic B.P at 180 min was 66.10 ± 3.88 in group A and 69.18 ± 6.16 in group B. There is no significant difference in diastolic BP between two groups in different time interval.

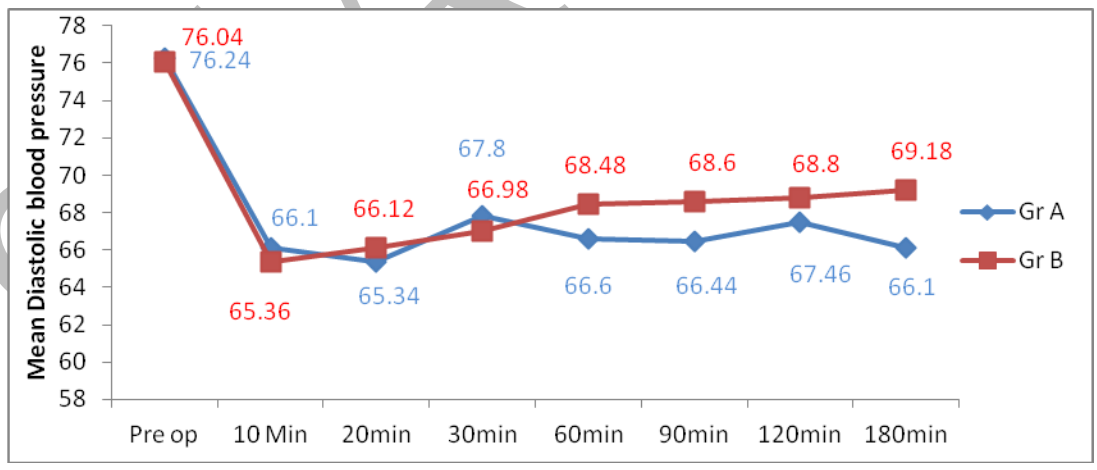

Figure 3: Bar graph showing the Diastolic blood pressure (mm Hg) in different time interval in both groups

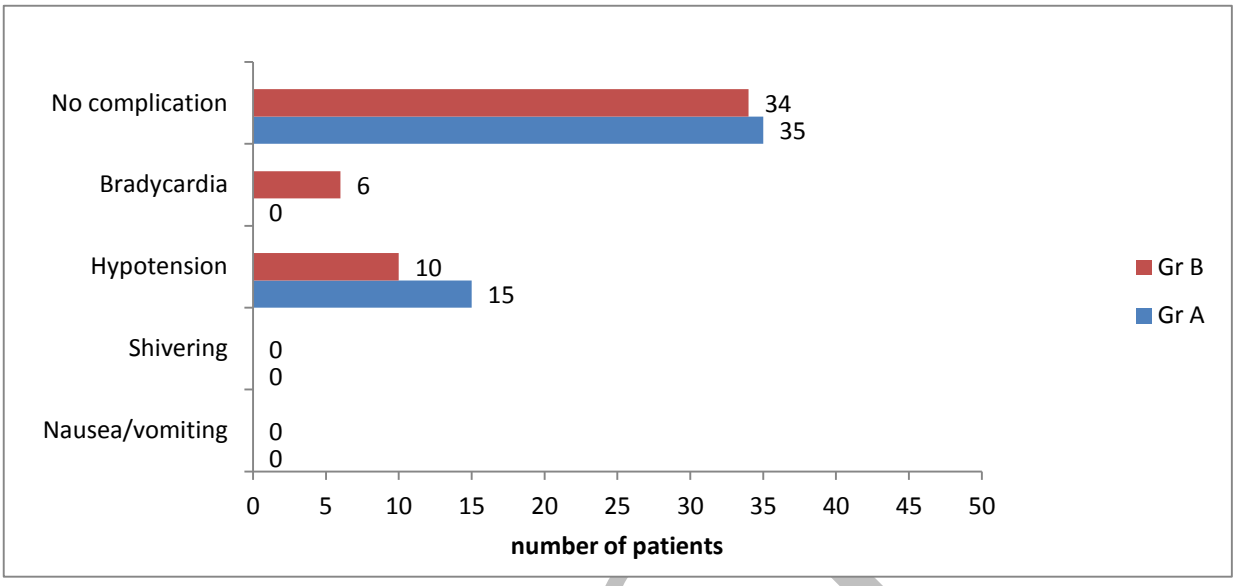

Figure 4: Bar graph showing the frequency distribution of different complications in patients of both group (N=100)

Above figure 4 shows hypotension developed in 15(30%) patients in group A whereas 10(20%) patients in group B. Only 6(12%) of 50 patient in group B had bradycardia. 69 patients (35 in Group A and 34 of Group B out of 50 patients in each group) had no complication.

DISCUSSION

It is well established now that local anaesthetics offer good anaesthesia in subarachnoid block. However the anaesthesiologist persistently attempted to improve the quality of block by adding adjuvant drugs to local anaesthetics. Adjuvants enhance the effectiveness and qualities of anaesthesia offered by local anaesthetic alone and also prolong the postoperative pain free period and decrease the requirements of systemic analgesic with minimum or no side effects and least possible effect on hemodynamic stability.

Rajni Gupta (2011), Subhi (2009) used dexmedetomidine as an adjuvant in subarachnoid block with bupivacaine. 90 adult patients of ASA grade I and II were divided into three groups of thirty patients each. Group A, B and C patients received inj. bupivacaine (15 mg) intrathecally with normal saline, with clonidine (50mcg) and with dexmedetomidine (5mcg) respectively. Patient in group dexmedetomidine had a significantly longer sensory

(404.43+114.83min) and motor block (309.93+101.71min). In the present study the mean time of sensory regression to SI was 275.50±15.36 min in group B and regression time of motor block to reach Bromage 0 was 220.80±11.57 min. Further these patients also had stable hemodynamics intra-operatively and post operatively. No significant differences in mean systolic and diastolic BP between two groups. Maximum lowering in heart rate occurred in group B.

Kenazi GE et al., (2006)[10] investigated the effect of adding 10 mcg intrathecal dexmedetomidine to 12 mg of bupivacaine and found that there was significant prolongation of sensory and motor blockade as compared to bupivacaine alone. Mean time for onset of sensory block at T10 in group A patients was 4.14 ± 1.06 min. whereas in group B patients it was 2.278 ± 1.09 min. Mean motor blockade was 4.81±1.03 min. where as in group B patients it was 3.96 ± 0.92 min. The mean time for onset of sensory and motor block was less in group B than group A and was statistically significant (<0.001). In present study 5 mcg intrathecal dexmedetomidine to 15 mg of bupivacaine was used. The mean onset time of both sensory (at T8 5.18 ± 0.77 min) and motor block (6.92±0.8) in Group B, was significantly rapid in comparison to group A(P< 0.001).

In Kenazi GE et al., mean regression time of block both sensory up to T10 dermatome and motor to bromage 3 scale, was prolonged in the group B (352±45 and 331±35). In present study Mean regression time of sensory block to S1 was 275.50 ±15.36 minutes and mean duration of motor block was 220.80 ± 11.57 in group B. Stable haemodynamics intra-operatively, no significant difference in BP and heart rate in both studies.

CONCLUSION

Dexmedetomidine a newer Alpha 2 agonist seems to be an attractive adjuvant to spinal Bupivacaine even in doses as low as 5 µg. Dexmeditomedine provides longer duration of sensory and motor block without increasing the incidence of significant adverse effects. Addition of dexmedetomidine avoids general anesthesia in few unexpected cases when surgical duration prolongs. Thus the observations and finding of above study allow us to conclude that it provide prolonged sensory and motor blockade, haemodynamic

stability, and excellent intraoperative analgesia.

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