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Original Research Article

Comparative study of hyperbaric 0.5% bupivacaine and hyperbaric 0.5% bupivacaine with low dose dexmedetomidine in spinal anaesthesia

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ABSTRACT

Background: Spinal anaesthesia remains one of the basic techniques in the arsenal of modern anaesthesiology despite the waxing and waning of its popularity over last 100 years since its introduction into clinical practice.It avoids biochemical and metabolic changes consequent to the stress of general anesthesia for surgery as well as provides near optimal conditions for surgery. In present study, we tried to study effectiveness of intrathecal 0.5% heavy bupivacaine alone with Dexmedetomidine as an adjuvant to intrathecal 0.5% heavy bupivacaine for lower limb and lower abdominal surgeries.

Methods: The present study was conducted in the department of anaesthesiology from December 2011 to September 2013.This study was a prospective, randomised controlled, single blind, study conducted in 100 patients of ASA grade I and II undergoing elective surgeries under spinal anaesthesia. The patients were divided randomly into two groups, containing 50 patients in each group. Dosages of drugs selected are divided as Group B: Patients received 3 ml of 0.5% hyperbaric bupivacaine (15mg) and Group BD: Patients received 3 ml of 0.5% hyperbaric bupivacaine (15mg) plus 10 µg Dexmedetomidine. Spinal block characteristics, Mean arterial pressure, Mean pulse rate, sedation and side effects were studied during intra-operative and postoperative period.

Results: It was found from present study that in Dexmedetomidine group time to reach T10 sensory blockade and complete motor blockade was earlier and a higher level of sensory blockade compared to control group achieved. Duration of sensory, motor blockade and duration of analgesia was significantly prolonged in the Dexmedetomidine group compared to the control group. Hemodynamic parameters were preserved both intra-operatively and postoperatively. However there were a small percentage of patients who developed hypotension and bradycardia which were easily managed without any untoward effect. Hence Dexmedetomidine is a better neuraxial adjuvant for providing early onset of sensory and motor blockade, prolonged sensory blockade and post operative analgesia and adequate sedation.

Conclusions: Intrathecal low dose Dexmedetomidine in a dose of 10µg along with 0.5% hyperbaric bupivacaine is an addition into anaesthesiologist's armamentarium for spinal anaesthesia in patients undergoing elective lower abdominal and lower limb surgeries.

Keywords: Dexmedetomidine, Hyperbaric bupivacaine, Spinal anaesthesia

INTRODUCTION

Spinal anaesthesia remains one of the basic techniques in the arsenal of modern anaesthesiology despite the waxing and waning of its popularity over last 100 years since its introduction into clinical practice. It avoids biochemical and metabolic changes consequent to the stress of general anaesthesia for surgery as well as provides near optimal conditions for surgery.[1] The main advantage being its simplicity, ease of performance, reliability, requirement of minimal apparatus and minimal effect on blood

chemistry apart from producing dense sensory and motor blockade.[2]

Its main disadvantage relates to its limited duration of action and hence lack of long-lasting post-operative analgesia.[3] In recent years, use of intrathecal adjuvants has gained popularity with the aim of prolonging the duration of block, better success rate, patient satisfaction, decreased resource utilization compared with general anaesthesia and faster recovery.[4] The quality of the spinal anaesthesia has been reported to be improved by the addition of opioids such as morphine, fentanyl and sufentanil and other drugs such as dexmedetomidine (DXM), clonidine, magnesium sulfate, neostigmine, ketamine and midazolam.[4,5]

Intrathecal a2-agonists used as adjuvant drugs to local anaesthetics potentiate the effect of local anaesthetics and allow a decrease in the required doses.[6] Dexmedetomidine is an a2-adrenoreceptor agonist that is approved as an intravenous sedative and co analgesic drug. Intravenous Dexmedetomidine results in a significant opioid-sparing effect as well as a decrease in inhalational anaesthetic requirements.[7,8]

In present study, we tried to study effectiveness of intrathecal 0.5% heavy bupivacaine alone with Dexmedetomidine as an adjuvant to intrathecal 0.5% heavy bupivacaine for lower limb and lower abdominal surgeries.

METHODS

The study was carried out in tertiary care hospital and study protocol was approved by Institutional Ethics Committee. The study was a prospective, randomised, single-blind, controlled, single centre study. The study was conducted in a Tertiary care level institute in department of anaesthesiology between December 2011 and September 2013.Patients were examined one day prior to surgery and baseline recordings of pulse rate, blood pressure and other vitals were recorded. Informed written consent was obtained from the patients prior to joining the study. Randomization is used to minimize bias. Randomization was done in the block of 2 as per a computer-generated code. The randomization code was sealed in an envelope. The code number of each individual was also sealed in the envelope.

The study consists of 100 patients in the age group 20-55 years of either gender belonging to ASA grade I and II scheduled for lower abdominal and lower limb surgeries. Patients were randomally allocated in 2 groups. Each group consisted of 50 patients having Group-B as Control group which received 0.5% hyperbaric bupivacaine 3cc (15 mg) and Group-BD which received 0.5% hyperbaric bupivacaine 3cc (15mg)+10µg Dexmedetomidine. Spinal block characteristics, Mean arterial pressure, Mean pulse rate, sedation and side effects were studied during intra-operative and postoperative period

Statistics

'Sample t' test, Chi-square test, Mann Whitney U test and sample proportion test was used depending upon the nature of data.

RESULTS

Table 1: Distribution according to age, weight, height and sex.

Characteristics		Group B (Mean± SD)	Group BD (Mean ± SD)	"p" Value
Age (years)		41.44±8.394	40.72±8.447	0.670
Weight (kgs)		62.58±7.445	61.68±7.617	0.552
Height (cms)		159.26± 7.292	161.62± 7.931	0.125
Gender	Males	26 (52%)	29 (58%)	0.861
	Females	24 (48%)	21 (42%)	

Parametric Data expressed as Mean ± S.D.

By using 2 independent sample t-test p-value >0.05, hence there is no significant difference between mean age (years), mean Height (cm), mean weight (kg) in group B and group BD.

By using 2 sample proportion test p-value >0.05 hence, there is no significant difference between proportion of gender in group B and group BD.

Table 2: Spinal block characteristics.

Spinal Block characteristics	Group B Mins. (Mean±S.D)	Group BD Mins. (Mean±S.D)	"p" value
Time to reach T10 sensory blockade	4.42±1.14	2.76±1.00	<0.001
Time to reach maximum level of sensory blockade	8.940±1.007	6.520±0.863	<0.001
Time required for maximum motor blockade	7.200±1.212	4.040±1.049	<0.001
Duration of two segment regression	92.56±11.846	137±13.062	<0.001
Duration of sensory regression to S1	172.54±12.073	300.20±21.688	<0.001
Total duration motor blockade	149.22±10.469	256.30±36.897	<0.001
Duration of analgesia	187.32±16.448	357.46±30.642	<0.001

In Dexmedetomidine group time to reach T10 sensory blockade and complete motor blockade was earlier and a higher level of sensory blockade compared to control group achieved. Duration of sensory, motor blockade and duration of analgesia was significantly prolonged in the Dexmedetomidine group compared to the control group.

Table 3: Sedation score.

Sedation score	Group		Total	"p" value
	Group B	Group BD		
1	2	0	2	< 0.001
2	48	39	87	
3	0	11	11	
Total	50	50	100	

By using Mann Whitney U test p-value < 0.05 therefore there is significant difference between sedation score in group B and group BD.

Table 4: Mean PR at various duration.

PR at	PR per min (Mean ± SD)		"p" value
	Group B	Group BD	
Pre operative	84.560±5.195	84.200±4.486	0.712
1st min	83.00±6.260	83.720±5.595	0.546
5th min	79.200±5.628	77.80±5.718	0.220
15th min	74.760±5.709	73.28±6.643	0.235
30th min	75.880±5.847	73.360±7.073	0.055
60th min	76.120±6.239	74.200±7.387	0.163
120th min	81.120±7.397	81.400±6.788	0.844
180th min	83.840±6.674	82.960±7.287	0.530

By using 2 independent sample t-test p- value >0.05 therefore there is no significant difference between mean pulse rate in group B and group BD. Maximum fall in mean pulse rate was seen at 15 minute in both group and was both statistically and clinically insignificant.

Table 5: Mean MAP at various duration.

MAP at	MAP mmHg (Mean ± SD)		"p" value
	Group B	Group BD	
Pre operative	93.141±4.300	92.845±4.312	0.732
1st min	91.660±3.014	91.240±3.242	0.504
5th min	86.020±3.836	84.820±4.336	0.146
15th min	83.380±6.636	82.020±5.316	0.261
60th min	85.840±4.162	85.460±4.195	0.650
120th min	88.820±3.121	88.060±3.749	0.273
180th min	88.860±4.399	88.180±3.480	0.393

By using 2 independent sample t-test p-value >0.05 therefore there is no significant difference between mean MAP in group B and group BD. Maximum fall in mean MAP was seen at 15 minute in both group and was both statistically and clinically insignificant.

Table 6: Side effects.

Parameter	Number of patients		"p" value
	Group B (n= 50)	Group BD (n= 50)	
Hypotension	2 (4.0%)	3 (6.0%)	0.999
Bradycardia	1 (2.0%)	2 (4.0%)	0.999
Nausea	0	1 (2.0%)	0.999

Two patients in Group B and three patients in Group BD had hypotension and required vasopressors and additional fluids. Thus more patients required additional fluid and vasopressors in Group BD as compared to patients in Group B, but this difference was found to be statistically not significant (p >0.05) by using chi-square test. One patient in Group B required Inj. Atropine for bradycardia while two patients in Group BD required treatment for bradycardia. The difference was statistically insignificant (p >0.05) by using chi-square test.

Nausea was experienced by only one patient in Group BD while no patients in Group B experienced it which is statistically insignificant (P >0.05) by using chi-square test.

DISCUSSION

Pain is one of the first sensations known to mankind from the beginning. Analgesic properties were found when intraspinal or epidural Dexmedetomidine was used in animal studies.[9,10] The first use of intrathecal Dexmedetomidine in humans based on previous animal studies.[4,5] Was reported by Kanazi et al, in 2006.[11] Dexmedetomidine is an highly selective, specific and potent alpha- 2 adrenergic agonist.[11-13] It is eight times more alpha-2 selective than Clonidine, producing faster onset and significantly longer duration of analgesia than bupivacaine alone, when used as an adjuvant.[12]

It was found from present study that in Dexmedetomidine group time to reach T10 sensory blockade and complete motor blockade was earlier and a higher level of sensory blockade compared to control group achieved. Duration of sensory, motor blockade and duration of analgesia was significantly prolonged in the Dexmedetomidine group compared to the control group. Hemodynamic parameters were preserved both intra-operatively and postoperatively. However there were a small percentage of patients who developed hypotension and bradycardia which were easily managed without any untoward effect. Three patients in Dexmedetomidine group and two patients in control group developed hypotension requiring treatment. Two patients in Dexmedetomidine group and one patient in control group developed bradycardia requiring treatment. More number of patients in the Dexmedetomidine group was sedated but easily arousable. Only one patient from Dexmedetomidine group developed nausea. No patient had any respiratory depression, vomiting, shivering or CVS side effects like change in rate and rhythm, in either of the groups and

hence can be an attractive alternative for opioids for prolonging spinal analgesia. It may be more suitable for major surgeries on abdomen and lower extremities. The drawback of intrathecal Dexmedetomidine is increase in duration of motor blockade which may not be suitable for short duration of surgeries. Hence Dexmedetomidine is a better neuraxial adjuvant for providing early onset of sensory and motor blockade, prolonged sensory blockade and post operative analgesia and adequate sedation.

CONCLUSION

From the present study it can be concluded that intrathecal low dose Dexmedetomidine in the dose of 10µg along with 3 cc 0.5% hyperbaric bupivacaine, lead to an earlier onset and prolonged duration of sensory and motor blockade, excellent postoperative analgesia, with minimal adverse effects and stable hemodynamic conditions.

In conclusion intrathecal low dose Dexmedetomidine in a dose of 10µg along with 0.5% hyperbaric bupivacaine is an addition into anaesthesiologist's armamentarium for spinal anaesthesia in patients undergoing elective lower abdominal and lower limb surgeries.

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