

To Evaluate the Effect of Addition of Dexmedetomidine to hyperbaric Bupivacaine Intrathecally in Infraumbilical Surgeries

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ABSTRACT

Introduction: In order to extend the intraoperative analgesia into postoperative period, following spinal anaesthesia, various spinal adjuvants are being used in anaesthetic practice. Dexmedetomidine is a centrally acting α_2 agonist that provides excellent sedation without respiratory depression. Therefore, present study was undertaken to evaluate the efficacy of Dexmedetomidine to hyperbaric Bupivacaine intrathecally in infraumbilical surgeries.

Material and Methods: The present prospective study enrolled 50 inpatients of 18-60 year of either sex for various elective infra-umbilical surgeries under Sub-Arachnoid Block. The patients were randomly divided into two groups, to receive bupivacaine (15 mg) in both the groups with + 0.5 ml normal saline in group A and 5 μ g dexmedetomidine diluted with normal saline (0.5 ml), total 3.5ml dose in each group. The onset and duration of sensory and motor block, doses of rescue analgesia were evaluated. The statistical analysis of obtained data was carried out by using statistical package for social science (SPSS) evaluation version 20. The level of significance considered at $p < 0.05$ using Chi-square test.

Results: Mean time for onset sensory block was 4.34 ± 0.74 minutes in group A and 3.14 ± 1.23 minutes in group B with insignificant p value. Mean time for onset motor block was 5.45 ± 0.7 minutes in group A and 4.27 ± 0.24 in group B with insignificant p value. There was increased duration of both sensory and motor block after addition of 5 mcg Dexmedetomidine to 15 mg of 0.5% hyperbaric Bupivacaine in spinal anaesthesia along with significant difference noted in both the groups regarding number of doses of rescue analgesia.

Conclusion: The present study concludes that as Dexmedetomidine offers better properties that includes hemodynamic stability with minimal side effects along with better post-operative analgesia, it can be employed in infra-umbilical surgeries as an neuraxial adjuvant to hyperbaric Bupivacaine.

Keywords: Dexmedetomidine; Bupivacaine; Technique

INTRODUCTION

Spinal anesthesia is the most frequently used method for lower abdominal surgeries as this technique is easy to administer as well as very economical. However, spinal anesthesia using short duration local anesthetics poses difficulty in management of postoperative pain, henceforth use of early analgesic is needed in the postoperative period.¹ Therefore, in order to extend the intraoperative analgesia into postoperative period, following spinal anaesthesia, various spinal adjuvants like buprenorphine and fentanyl, morphine, ketamine, clonidine are being used in anaesthetic practice. Such adjuvants have been helpful in induction of early ambulation along with prolongation of analgesia but at the expenses of their related adverse effects.² These adjuvants (especially opioids) are associated with side effects like pruritus, respiratory depression, urinary retention, post-operative nausea and vomiting which limit their use.

Hence, intrathecal α_2 agonists are used as adjuvants to local anesthetics to increase the effects of local anesthetics without producing respiratory depression.³

Dexmedetomidine is a short term medication for sedation/analgesia in the intensive care unit. It is centrally acting α_2 agonist approved by United States FDA for ICU sedation upto 24 hours. It results in excellent sedation without causing respiratory depression, provides analgesia and has sympatholytic properties.⁴ Hence present study was undertaken to assess the efficacy of Dexmedetomidine to hyperbaric Bupivacaine intrathecally in infraumbilical surgeries.

MATERIAL AND METHODS

The present prospective study enrolled 50 inpatients of 18-60 year of either sex in the Rama Medical College, Ghaziabad with ASA I and II physical status admitted for various elective infra-umbilical surgeries under Sub-Arachnoid Block. Patients on antiarrhythmic drugs, beta blockers, anticoagulants, ACE inhibitors, pregnant women, contraindications to spinal anaesthesia like patient refusal, were excluded from the study. Informed written consent was obtained pre-operatively from patients. Patients were advised fasting 6 hours prior to surgery and were premedicated with tablet Ranitidine and tablet Alprazolam. The patients were randomly divided into two groups, to receive bupivacaine (15 mg) in both the groups with + 0.5 ml normal saline in group A and 5 μ g dexmedetomidine diluted with normal saline (0.5 ml), i.e. 3.5ml dose in each group.

Routine baseline monitors such as pulse, blood pressure, heart rate and respiratory rate, ECG were recorded. Peripheral intravenous line was secured and following infusion of 15 ml/kg of ringer lactate solution over 15-30 minutes, lumbar puncture was performed under aseptic preparation using a 25G Quincke spinal needle at L3-L4 position with patient in sitting or lateral position by using midline approach after the local infiltration with 2% lignocaine. Immediately after the intrathecal injection over 10-15sec approximately, the patients were made to lie supine. All the vital signs were monitored intra-operatively which were recorded at interval of 5 minutes initially upto half an hour of surgery followed by interval of 10 minutes towards the end of surgery.

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The study evaluated onset as well as duration of sensory and motor block, doses of rescue analgesia given post-op within 12 hours of surgery. The time taken to reach T10 dermatome, Bromage 3 scale and regression of block to S1 dermatome and Bromage 0 were recorded. The pin prick method at midclavicular line anteriorly every 15 min was used to evaluate the time of onset of sensory block. Modified Bromage scale was used to assess motor block was assessed and intraoperative sedation was evaluated by Modified Ramsay sedation scale.^{2,5}

STATISTICAL ANALYSIS

The statistical analysis of data was done by using statistical package for social science (SPSS) evaluation version 20. Mean and standard deviation were calculated and the level of significance considered at $p < 0.05$ using Chi-square test.

RESULTS

Table-1 shows Onset and recovery of sensory and motor blocks. Mean time for onset sensory block was 4.34 ± 0.74 minutes in group A and 3.14 ± 1.23 minutes in group B with insignificant p value. Mean time for onset motor block was 5.45 ± 0.7 minutes in group A and 4.27 ± 0.24 in group B with insignificant p value. Mean time taken for sensory regression to S1 was 172 ± 13.15 minutes in group A and 327.22 ± 21.11 in group B with significant p value < 0.05 . Mean time taken for motor block regression to Bromage 0 (in min) was 153 ± 12.13 minutes in group A and 305 ± 9.78 in group B with significant p value < 0.05 . There was significant difference noted in both the groups regarding number of doses of rescue analgesia.

DISCUSSION

Alpha-2 adrenergic agonists have been a topic of interest as an alternative to neuraxial opioids.⁶ Clonidine, an α_2 -adrenergic receptor (α_2 -AR) agonist, has been widely used and investigated as an analgesic adjuvant for anesthesia and pain therapy. Dexmedetomidine belongs to the same class but have more favorable and different pharmacokinetic profile. It was first introduced as a short-term intravenous sedative in the intensive care unit. But as this drug also demonstrates analgesic properties related to α_2 -AR binding and is 8-10-fold more selective for α_2 -AR than clonidine, thus it can be used as a systemic analgesic adjuvant, mainly in the acute perioperative setting.⁷

Kanazi GE et al⁸ conducted a study to evaluate the effect of dose

of 3 microg of dexmedetomidine and 3 microg of clonidine, as an adjunct to intrathecal bupivacaine, and found that both produces a similar increase in the duration of the both motor and sensory block along with lack of sedation and hemodynamic stability. Kalso et al⁹ also reported similar effects. Raval DL et al¹⁰ also compared dexmedetomidine v/s clonidine with bupivacaine intrathecally in lower limb surgeries and concluded that both Dexmedetomidine $3\mu\text{g}$ and Clonidine $30\mu\text{g}$ when used as an adjuvant to intrathecal hyperbaric Bupivacaine 0.5% 15mg provides early onset of both motor and sensory block, increases two segment regression time and delayed motor and sensory blockade as well as prolonged postoperative analgesia. Hence, it was evident that 3-5 μg Dexmedetomidine would be equipotent to 30-45 μg Clonidine when used as a neuraxial adjuvant to Bupivacaine.⁵

The present study compared patients with similar demographic profile, type and duration of surgery and revealed that there was early onset as well as increased duration of both sensory and motor block after addition of 5 mcg Dexmedetomidine to 15 mg of 0.5% hyperbaric Bupivacaine in spinal anaesthesia. In the present study, the dexmedetomidine group also required significantly less number of rescue analgesics as compared to bupivacaine group. Similarly Mahendru V et al¹¹ commenced a similar study and revealed that intrathecal dexmedetomidine results in prolongation of motor and sensory block, hemodynamic stability and decreased need of rescue analgesics in 24 hours post-operatively as compared to fentanyl, clonidine or alone bupivacaine. Shukla D et al,¹² Patro SS et al,² Ch. Srinivas Rao et al⁵ also reported that onset of anesthesia was more rapid as well as of increased duration in the dexmedetomidine group. The direct stimulation of pre- and post-synaptic α_2 adrenoreceptors present in the dorsal grey matter of spinal cord leads to inhibition of the the release of nociceptive neurotransmitters resulting in the analgesic action of intrathecal or epidural dexmedetomidine.¹³

CONCLUSION

The present study concludes that Dexmedetomidine intrathecally as an adjuvant to plain bupivacaine results in significant prolongation of sensory and motor blockade as well as significantly less number of rescue analgesics as compared to bupivacaine group. Thus, as it offers better properties that includes hemodynamic stability with minimal side effects along

	Group A (bupivacaine (15 mg) + 0.5 ml normal saline, total 3.5ml dose)	Group B (bupivacaine (15 mg) + 5 μg dexmedetomidine diluted with 0.5 ml normal saline, total 3.5ml dose)	P value
Age	42 \pm 5.02	41 \pm 4.75	>0.05
Mean time for onset sensory block (in min)	4.34 \pm 0.74	3.14 \pm 1.23	>0.05
Mean time for onset motor block (in min)	5.45 \pm 0.7	4.27 \pm 0.24	>0.05
Mean time taken for sensory regression to S1 (in min)	172 \pm 13.15	327.22 \pm 21.11	<0.05
Mean time taken for motor block regression to Bromage 0 (in min)	153 \pm 12.13	305 \pm 9.78	<0.05
Rescue Analgesia (number of analgesia given post-op within 12 hours of surgery)			<0.05
0	0	0	
1	0	14	
2	4	10	
3	21	1	

Table-1: Onset and recovery of sensory and motor blocks

with better post-operative analgesia, it can be employed in infra-umbilical surgeries as an neuraxial adjuvant to hyperbaric Bupivacaine.

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