

COMPARISON OF ANALGESIA AND HAEMODYNAMIC RESPONSE TO INTRATHECAL CLONIDINE WITH BUPIVACAINE AND INTRATHECAL DEXMEDETOMIDINE WITH BUPIVACAINE IN UROLOGICAL SURGERIES

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Abstract

Background: Spinal anaesthesia is preferred due to rapid onset, segment blockade, control over analgesia, decreased risk of thromboembolic events, and reduced blood loss. Adjuvants such as clonidine and dexmedetomidine are used to prolong the duration of the spinal block following intrathecal administration. This study evaluated and compared the effects of clonidine and dexmedetomidine as adjuvants to intrathecal hyperbaric bupivacaine in patients scheduled for elective urological surgeries. **Materials and Methods:** This observational study was conducted at Dhanalakshmi Srinivasan Medical College, Perambalur, for 12 months (March 2021- March 2022). One hundred sixty patients were divided into two groups containing 80 each. Group A received 3 ml of 0.5% hyperbaric Bupivacaine with 30 µg in preservative-free Normal saline, and Group B received 3 ml of 0.5% hyperbaric Bupivacaine with 3 µg of dexmedetomidine in preservative-free Normal saline. **Result:** There is no significant difference in gender, age, ASA, maximum level of sensory block, and two-segment regression between groups. There is a significant difference in the onset of sensory block, the onset of motor blockade, the duration of motor blockade, and rescue analgesia required between groups ($p < 0.0001$). There was no significant difference in systolic, diastolic blood pressure, heart rate, and SpO₂ between groups at various intervals. Patients with hypotension, bradycardia, and pruritis were easily managed with intravenous fluids and vasopressors, and the mean sedation score was 2.37. **Conclusion:** The study concluded that using additives with heavy bupivacaine, especially alpha 2 agonists had a significantly faster onset of the motor and sensory blockade and prolonged duration of analgesia.

INTRODUCTION

Spinal anaesthesia is the commonly preferred technique because of its rapid onset, ability to produce segment blockade, greater control over analgesia, decreased risk of thromboembolic events, reduces major blood loss and minimizes or complete avoids the problem associated with general anaesthesia, such as airway management.^[1] Despite the advantages, it also has drawbacks of producing hypotension, post-dural puncture headache, failed blocks and high spinal blocks etc. Bupivacaine is the local anaesthetic agent used in spinal anaesthesia due to its longer duration of action when compared

with other agents like lignocaine, chloroprocaine etc. Many adjuvants are added to intrathecal local anaesthetics, thereby improving the quality of intraoperative analgesia and prolonging analgesia in the postoperative period.^[2] However, their use is thwarted either due to the adverse effects of adjuvants or unreliable postoperative analgesia.^[1] Opioids being the commonly used intrathecal adjuvants, their intolerable side effects, such as pruritus, nausea, vomiting, urinary retention, and delayed respiratory depression, have prompted further research towards non-opioid analgesics with lesser side effects.^[2] Centrally acting α -2 adrenoceptor agonists such as Clonidine and

Dexmedetomidine have been used as adjuvants to local anaesthetic agents because of their sedative, analgesic, and hemodynamic stabilizing effect. They have been found to prolong the duration of the spinal block following intrathecal administration.^[3]As a whole, these adjuvants potentiate the effect of local anaesthetics, thus allowing a decrease in the required dose of local anaesthetics.^[4]Most of the clinical studies about the intrathecal alpha 2 adrenergic agonists are related to Clonidine.^[5]

Many recent studies have studied the effect of intrathecal dexmedetomidine in providing dense anaesthesia and analgesia. Clonidine is a partial α -adrenoreceptor agonist which is used intrathecally. Its additions prolong the duration of both motor and sensory spinal blockade.^[4]Dexmedetomidine is an alpha 2-adrenoreceptor agonist with an alpha 2: alpha 1 selectivity ratio eight times higher than clonidine.⁴ Dexmedetomidine has various applications and procedures in perioperative and critical care settings.^[6]It is also emerging as a valuable adjunct to regional anaesthesia and analgesia, where gradually evolving studies can build evidence for its safe use in central neuraxial blocks.^[7]

Based on earlier human studies, it is hypothesized that intrathecal 5 μ g Dexmedetomidine would produce a more postoperative analgesic effect with hyperbaric bupivacaine in spinal anaesthesia with minimal side effects.^[8]Because of little evidence of dexmedetomidine efficacy as an adjuvant to hyperbaric bupivacaine in spinal anaesthesia, we strived to explore its usefulness and also compare this new α 2 adrenergic agonist with the previously established and widely used adjuncts clonidine and fentanyl on the spinal block characteristics in patients scheduled for urological surgery. Hence, this study aimed to evaluate and compare the effects of clonidine and dexmedetomidine as adjuvants to intrathecal hyperbaric bupivacaine in patients scheduled for elective urological surgeries.

MATERIALS AND METHODS

This observational study was conducted at Dhanalakshmi Srinivasan Medical College, Perambalur, for 12 months (March 2021- March 2022). Ethical clearance was obtained from the Institutional Human Ethics Committee of Dhanalakshmi Srinivasan Medical College. Informed written consent in the local language (Tamil) was obtained from the participants before the commencement of the study. All the information collected was kept confidential and was used only for research.

Inclusion Criteria

Patients under 18-60 years old with ASA grades I and II undergoing elective urological surgeries were included.

Exclusion Criteria

Patients with ASA grades III and IV, coagulopathy and sepsis, contraindication to subarachnoid block, renal/hepatic dysfunction, patients allergic to local anaesthetics, patients with a history of coronary artery disease, arrhythmias, and cerebrovascular accidents, patients on beta-blocker or clonidine therapy and patients who refused to take part in the study were excluded.

One hundred sixty patients were divided into two groups containing 80 each. Group A received 3 ml of 0.5% hyperbaric Bupivacaine with 30 μ g in preservative-free Normal saline, and Group B received 3 ml of 0.5% hyperbaric Bupivacaine with 3 μ g of dexmedetomidine in preservative-free Normal saline. The volume of the drug solution was kept constant at 3.5 ml for administration in both groups. All patients explained the anaesthesia technique and were kept NPO for 8 hrs before surgery. No specific additional investigations were required of the study.

All patients were given a tablet of alprazolam 0.25mg on the night before surgery and a tablet of Pantoprazole 40 mg on the day of surgery 2 hours prior. The patients were shifted to the pre-operative holding area and re-assessed again. Baseline vital parameters of patients (Pulse rate, SBP, DBP, and MAP) were recorded 1 hour before entering the operation theatre. The onset of the sensory blockade and motor blockade, the maximum level of the sensory blockade, and time taken for the same, maximum level of motor blockade and time taken for the same, two segments of sensory regression time, total duration of analgesia, the total duration of the sensory blockade and motor blockade were monitored at the intraoperative period. Sensory blockade was tested using the pinprick method with a blunt-tipped 27G needle every minute for the first 5 mins and every 5 mins for the next 15 mins and every 10 mins for the next 30 mins, and every 15 mins till the end of the surgery, and after that every 30 mins until the sensory block was resolved. The Bromage scale assessed the quality of motor blockade, and Ramsay's sedation score evaluated the level of sedation.

Hemodynamic monitoring was done during the block every 5 mins for the first 15 mins and every 10 mins for the next 30 mins. Once in 15 mins till the end of surgery and postoperatively every hour employing a multi-parameter monitor which displays heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), ECG and SpO₂. Postoperative assessment of vitals, sensory blockade, and motor Blockade was done every 15 min in the recovery room. Monitoring continued until Bromage score became 0 and sensory regression to S1 dermatome was achieved. afterwards, the patient was shifted to the postoperative ward.

Every 15 min after the end of the surgery, a pain assessment was done using VAS. It was assessed in the recovery room till VAS \geq 4 was reached. The

effective analgesic duration was to be taken as time from onset of intrathecal injection and time to attain VAS ≥ 4 or whenever the patient complained of severe pain, Inj.Diclofenac 75mg IM was given. Monitoring was continued for up to 24 hrs to determine the occurrence of complications such as nausea, dry mouth, respiratory depression, vomiting, and pruritis. Symptoms of any transient neurological symptoms, such as pain and paresthesia in the buttocks, neck, leg, or persisting pain that radiates to the lower limb after recovery of SAB within 72 hrs, were also enquired.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS software. Descriptive statistics were described using mean, median, percentages, and standard deviations. Inferential statistics were described using an appropriate statistical test.

RESULTS

In group A, 50 (62.5%) were males, and 30 (37.5%) were females, and in group B, 48 (60%) were males, and 32 (40%) were females. Most patients aged 41-50 years and ASA I among the groups. In group A, the maximum 56 (70%) patients were a sensory block of T6, 11 (13.8%) patients was a sensory block of T5, 11 (13.8%) patients was a sensory block of T7, and 2 (2.5%) patients was a sensory block of T8. In group B, the maximum 56 (70%) patients were a sensory block of T6, 13 (16.3%) patients was a sensory block of T5, and 11 (13.8%) patients was a sensory block of T7. In both groups, the maximum number of patients had sensory blocks upto T6. There is no significant difference in gender, age, ASA, and maximum level of sensory block between groups [Table 1].

The mean onset of sensory block in group A was 4.14 ± 0.74 , and in group B was 2.58 ± 0.28 . The mean onset of motor block in group A was 3.13 ± 0.54 , and in group B was 2.71 ± 0.51 . The mean duration of the motor block in group A was 284.33 ± 40.20 , and in group B was 334.9 ± 3.54 . The mean two-segment regression in group A was 104.7 ± 7.38 , and in group B was 103.5 ± 7.12 . No significant difference in the two-segment regression between groups ($p=0.3$).

The mean rescue analgesia required in group A was 88.28 ± 10.44 , and in group B was 116.03 ± 13.88 . There is a significant difference in the onset of sensory block, the onset of motor blockade, the duration of motor blockade, and rescue analgesia required between groups ($p<0.0001$) [Table 2].

No significant difference in systolic blood pressure between groups at baseline, 5, 10, 15, 30, 60, 90, 120, 180, 240, 300, and 350 minutes [Figure 1].

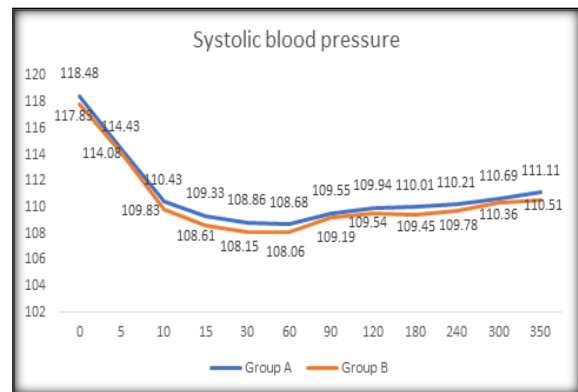


Figure 1: Systolic blood pressure between groups

No significant difference in diastolic blood pressure between groups at baseline, 5, 10, 15, 30, 60, 90, 120, 180, 240, 300, and 350 minutes [Figure 2].

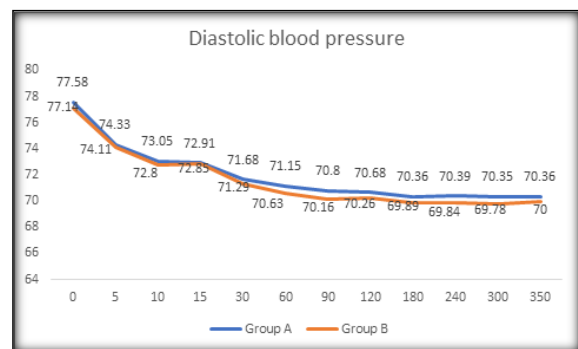


Figure 2: Diastolic blood pressure between groups

No significant difference in heart rate between groups at baseline, 5, 10, 15, 30, 60, 90, 120, 180, 240, 300, and 350 minutes [Figure 3].

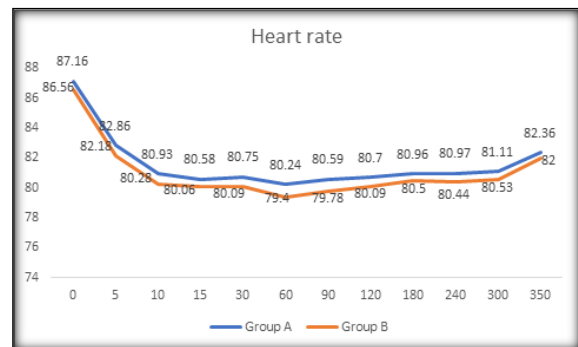


Figure 3: Heart rate between groups

No significant difference in SPO₂ between groups at baseline, 5, 10, 15, 30, 60, 90, 120, 180, 240, 300, and 350 minutes [Figure 4]. The mean sedation score of Group A was 2.37 ± 0.487 in both groups.

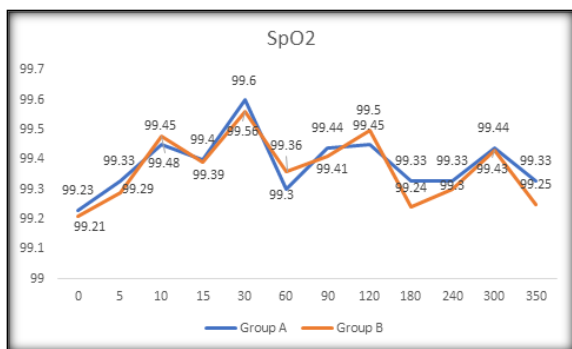


Figure 4: SpO2 between groups

Ten patients in the clonidine and eight in the dexmedetomidine group developed hypotension, which was managed easily with intravenous fluids and vasopressors. Two patients with clonidine and three patients with dexmedetomidine had bradycardia which was reversed with atropine in all patients. Pruritis was observed in 1 patient in the dexmedetomidine group, which subsided with antihistamines and corticosteroids. The mean sedation score of Group A was 2.37 in both groups, showing no significance, and patients were comfortable and easily arousable.

Table 1: Demographic data of the study

		Group A		Group B		P-value
		Frequency	Percentage	Frequency	Percentage	
Gender	Male	50	0.625	48	0.6	0.746
	Female	30	0.375	32	0.4	
Age	30-40	21	0.263	21	0.263	0.777
	41-50	53	0.663	54	0.675	
	> 50	6	0.075	5	0.063	
ASA	I	61	0.763	57	0.713	0.472
	II	19	0.238	23	0.287	
The maximum level of sensory block	T5	11	0.138	13	0.163	0.539
	T6	56	0.7	56	0.7	
	T7	11	0.138	11	0.138	
	T8	2	0.025	0	0	

Table 2: Blockade and rescue analgesia between groups

	Group A	Group B	P-value
Onset of sensory block	4.14 ± 0.74	2.58 ± 0.28	<0.0001
Onset of motor blockade	3.13 ± 0.54	2.71 ± 0.51	<0.0001
Duration of motor blockade	284.33 ± 40.2	334.9 ± 3.54	<0.0001
Two segment regression	104.7 ± 7.38	103.5 ± 7.12	0.3
Rescue analgesia required	88.28 ± 10.44	116.03 ± 13.88	<0.0001

DISCUSSION

Spinal anaesthesia is the most commonly used technique for urological surgeries. The use of additives (alpha 2 agonists) to local anaesthetics in the spinal has been shown to prolong both sensory and motor blockade and provide postop analgesia. In our study, the mean onset of sensory block (T10 level) in group A was 4.14 ± 0.74, and in group B was 2.58 ± 0.28. The results show a significant difference in the onset of the sensory block between groups (p<0.0001). Patients with group B had a shorter time to achieve the T10 level of sensory blockade. When compared with Mahendru V et al. study comparing clonidine, fentanyl and dexmedetomidine, there was a significant association with relating faster onset of sensory blockade in the dexmedetomidine group than clonidine.^[9]

In our study, the mean onset of motor block in group A was 3.13 ± 0.54, and in group B was 2.71 ± 0.51. The results show a statistically significant difference in the motor block onset between groups (p<0.0001). When comparing Mahendru V et al. clonidine, fentanyl and dexmedetomidine, there was no significant relation between the onset of motor block in the three groups to reach a Bromage score of 3.9, But in Gupta et al., the results were related to

my study showing a faster onset of motor block in the dexmedetomidine group than the clonidine group with a significant association.^[10]

In our study, the maximum number of patients had sensory blocks up to T6 in both groups. The results show no significant difference in the maximum level of the sensory block between groups (p=0.539). Ganesh M et al. also compared the difference between the maximum sensory level of a blockade in clonidine and dexmedetomidine groups relating to this study with no significant difference.^[11] In our study, the mean duration of the motor block in group A was 284.33 ± 40.20, and in group B was 334.9 ± 3.54. The results show significant motor block duration differences between groups (p<0.0001). Mahendru V et al. observed the duration of motor regression time to Bromage 0 was more with dexmedetomidine 275 ± 25 min than fentanyl 196 ± 27 and clonidine 199 ± 26 min, which coincides with this study.^[9]

In our study, the mean two-segment regression in group A was 104.7 ± 7.38, and in group B was 103.5 ± 7.12. The mean difference was 1.2, and the results show no significant difference in the two-segment regression between groups (p=0.300). Ganesh M et al. comparing two segment regressions between dexmedetomidine 136 ± 11.7 min and clonidine 136.7 ± 10.7 min were not statistically significant.^[11]

Kanazi GE et al. found a significant relationship between clonidine 101 ± 37 min and dexmedetomidine 122 ± 37 min when prolonged segment regressions.^[4]

In our study, the mean rescue analgesia required in group A was 88.28 ± 10.44 , and in group B was 116.03 ± 13.88 . The results show a significant difference in the rescue analgesia required between groups ($p < 0.0001$). While compared with Ganesh M et al., the mean time of rescue analgesia was highest in the dexmedetomidine group and lowest in the clonidine group, thus supporting this study.^[11] Jain D et al. found that epidural dexmedetomidine prolongs analgesia and decreases the need for rescue analgesics, with a significant fall in pulse rate and mean arterial pressure in patients undergoing lower-limb orthopaedic surgery.^[12]

The present study shows no significant difference in systolic blood pressure, diastolic blood pressure, heart rate, and SPO2 between groups at baseline, 5, 10, 15, 30, 60, 90, 120, 180, 240, 300 and 350 minutes. Ten patients with clonidine and eight with dexmedetomidine developed hypotension, bradycardia was reversed with atropine, and pruritis was subsided with antihistamines and corticosteroids. The mean sedation score of Group A was 2.37, and patients were comfortable and easily arousable. Yektaş A et al. found that the time to experience the first pain sensation in group 3 was significantly longer than in groups 1 and 2. Two different doses of dexmedetomidine resulted in an increased duration of analgesia and efficacy, decreased postoperative analgesic use, and no adverse effects.^[13] Liu L et al. study found that Intrathecal $5 \mu\text{g}$ dexmedetomidine significantly enhances the efficacy of spinal bupivacaine by 24% in patients undergoing cesarean section with spinal anaesthesia, and no additional side effect was observed.^[14]

CONCLUSION

The study concluded that using additives with heavy bupivacaine, especially alpha 2 agonists had a significantly faster onset of the motor and sensory blockade and prolonged duration of analgesia. The doses of 30 mcg clonidine and 3 mcg dexmedetomidine can benefit patients with minimal side effects and intense duration of blockade.

Limitations

In this study, the patients posted for elective urological procedures were taken. Most surgery's duration was a limited period within an hour. The usage of alpha 2 agonists prolonged the duration of

analgesia, which would be more useful in surgeries having a long duration.

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