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The Beneficiary Effects of Intravenous Dexmedetomidine on the Duration of Spinal Anesthesia in a Tertiary Care Hospital in South Kerala

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Abstract
Background: *Spinal anesthesia is commonly used in lower limb surgeries .Central mechanisms have been proposed to explain the prolongation of effect reported with the off-label use of dexmedetomidine as an adjuvant in local anesthetic admixtures. We evaluated whether IV dexmedetomidine can prolong the duration of sensory block associated with spinal anesthesia.*
Objective: *To evaluate the effect of intravenous dexmedetomidine on sensory regression, duration of motor block, hemodynamic profile, level of sedation and postoperative analgesia.*
Methodology: *60 patients of ASA grade I and II were enrolled in this study after getting informed consent and institutional ethical board clearance and randomly allocated into two groups. Group D received intrathecal 0.5% Heavy Bupivacaine, followed by infusion of intravenous dexmedetomidine 1µg/kg bolus over 10 minutes followed by 0.5µg/kg/hr infusion, patients in group C received intrathecal 0.5% bupivacaine heavy followed by infusion of same volume of normal saline as placebo*
Results: *Two segment dermatomal regression was achieved at 135±23.9 in group D. The time at which first analgesic was given to the patients when VAS >3 achieved that is in group D at 135± 23.9 min whereas in Group C it was only 77.7±11.7*
Keywords: *Intravenous dexmedetomidine, postoperative analgesia,sensory regression, spinal block.*

Introduction

Spinal anaesthesia is a well known technique used in a variety of surgical procedures including lower limb surgeries in orthopaedics. Various adjuvants has been used and extensively studied in order to decrease the dose of intrathecal local anesthetics.(1) Dexmedetomidine is a highly potent alpha 2 adrenergic agonist with a higher alpha $_{2:}$ alpha$_1$ selectivity of 1000:1 and a half life of 2 – 3 hours. It decreases the requirement of anaesthetic drugs, produces sedation/anxiolysis by attenuating blood pressure and heart rate, improves perioperative hemodynamics, provides sympatholytic activity and causes inhibition of RAAS.(2) Due to its faster onset of action, faster recovery and discharge times a new role as a sole agent for procedural sedation

is fast emerging.[3] Studies have demonstrated a shorter onset of blockade and significantly longer duration when dexmedetomidine was used as a supplement to regional anaesthesia with bupivacaine via intrathecal roots with stable hemodynamic profile.[4] IV dexmedetomidine prolongs the duration of sensory blockade and analgesia and reduces the requirement of analgesics with lesser incidence of bradycardia and hypotension intraoperatively as well as postoperatively. Commonly used intravenous methods of dexmedetomidine include a single-dose intravenous administration[5,6] before or after spinal anesthesia and a loading dose followed by continuous infusion. Intravenous route of dexmedetomidine preserving the beneficial effects caused by intrathecal route also has an additional satisfactory arousable sedation without causing respiratory depression[7] Hence the present study was conducted to assess the effects of intravenous dexmedetomidine on spinal anaesthesia or analgesia in patients undergoing lower limb surgeries.

Materials and Methods

After receiving approval from the Institutional Review Board of our hospital, 60 adult patients who were scheduled for lower limb orthopaedic surgery under spinal anesthesia were enrolled in this study. Written informed consent was obtained in all cases. All subjects had an American Society of Anesthesiologists physical status classification of either I or II, and all were between the ages of 18 and 65 years. This study was conducted from September 2012 to September 2013. Patients were excluded from this study if they refused to consent, use of opiods week prior to elective surgery, known history of drug allery, chronic alcohol abuse, if they had contraindications to regional anesthesia, including coagulopathy, or local skin infection, uncontrolled hypertension, diabetes. All patients were divided randomly into two groups (the control group, Group C; the study group, Group D) on alternate basis.

Patients who were scheduled for unilateral lower limb surgery under spinal anesthesia were preferred and unoperated leg was left free to test motor function during surgery.

A 50 cc syringe was prepared using the study drug i.e dexmedetomidine. For preparing the study drug, syringe 2 mL of dexmedetomidine (Xamdex©2mL containing 200 µg of dexmedetomidine) was added to 48 mL of normal saline to make up a total volume of 50ml.So each ml of the preparation contained 4µg of the study drug. Premedication included Tab. pantoprazole 40 mg + Tab. alprazolam 0.25 mg on the night before surgery.Patient was brought to the surgery table on the morning of surgery without any premedications. Upon arrival in the operating room, standard monitoring devices including an electrocardiogram, a pulse oximeter, capnography to measure end tidal CO_2 saturation, and a noninvasive blood pressure cuff were applied. Before undergoing spinal anesthesia, all patients were administered 500 ml of lactated Ringer's solution for pre-loading, followed by infusion at 5-10mL/kg/hr during intra operative period via an 18 G cannula on the dorsum of hand, after which the study drug was administered over a 10 min period. The baseline mean arterial pressure (MAP), heart rate (HR), and pulse oxygen saturation (SpO_2) were recorded. Five minutes after end of study drug infusion,

Patients were placed in the lateral decubitus position. After the intradermal infiltration of 3 ml of 2% lidocaine for local anesthesia, Spinal anesthesia was performed at the L3-L4 interspace using a standard midline approach with a 25 G quincke needle. When a free flow of cerebrospinal fluid was confirmed, 15 mg of Bupivacaine 0.5% (i.e.3mL) was injected intrathecally for 20 sec. Following the spinal anesthesia, patients were repositioned to the supine position and received 4 L/min of oxygen via a facial mask throughout the procedure. Patients allocated to study group received intravenously via an infusion pump a loading dose of 1µg/kg (0.25ml/kg) dexmedeto-midine over 10 minutes and a maintenance dose of 0.5µg/kg/hr(0.125ml/kg/hr) till end of surgery.

Patients allocated to the control group received 0.25 ml/kg of normal saline over 10 minutes and a maintenance dose of 0.125 ml/kg/hr during the procedure. The sensory block level was assessed by testing the loss of pinprick sensation with a blunt 25-guage needle along the midclavicular line bilaterally. The motor block level was assessed according to the Modified Bromage Scale (0 = no paralysis; 1 = unable to raise extended leg; 2 = unable to flex knee; 3 = unable to flex ankle). The sensory block level and the modified Bromage scale were assessed every 2 min within 20 min after the spinal injection and then every 10 min afterwards. The Ramsay sedation score (RSS) was used to assess sedation (1 = anxious and agitated; 2 = cooperative and tranquil; 3 = drowsy but responsive to verbal commands; 4 = asleep but briskly responsive to tactile stimulation; 5 = asleep and sluggish responses to stimuli; and 6 = asleep and no response). The MAP, HR, and SpO_2 levels and the RSS were recorded every 5 min.

For our study purpose, hypotension was defined as fall in MAP below 20% of baseline or a systolic pressure less than 90mm hg and was treated with incremental doses of intravenous ephedrine (6 mg) and a bolus administration of 250 ml lactated Ringer's solution over 10 minutes. Bradycardia was defined as heart rate below 50 beats per minute and was treated with 0.6 mg atropine. Respiratory depression was defined as Etco2 in excess of 50 mm Hg or respiratory rate below 12 breaths per minute. The primary outcome of this study was a comparison of the durations of spinal sensory and motor blocks among the two groups. The duration of the sensory block was defined as a two dermatome regression from the maximal level. Motor block duration was the time required to return to a modified Bromage scale of 1 after the achievement of 3. If the maximal modified Bromage scale didn't approach number 3, motor block duration was defined score 1 after the achievement of 2. The secondary outcomes were an evaluation of the sedation score and the regression time for RSS which is the time required to return to a RSS of less than 3 after the achievement of a score of 3. If the maximal RSS didn't approach number 3, regression time of RSS was defined as the time to return to a score 2 or under. We also evaluated the side effects of dexmedetomidine, including bradycardia, hypotension, respiratory depression and excessive sedation.

Postoperative pain score was measured by using VAS of 'zero' to 'ten' where 'zero' indicated no pain and 'ten' indicated worst imaginable pain. Rescue analgesia of injection Tramadol 50 mg IV was given if the VAS score was more than three.

The statistical analysis was performed with SPSS (Version 22) the categorical data was expressed in terms of rates, ratios and percentage and continuous data was expressed as mean ± standard deviation (SD). The data was analysed by chi-square test, test of proportion, student's unpaired 't' test and Mann Whitney test. A probability value (p value) of less than or equal to 0.05 was considered as statistically significant.

Results

In this study 23.3% in group D were females and 76.7% were males with a female to male ratio of 0.30 and 70% were males and 30% females in group C with a female to male ratio of 0.428 suggesting that demographic standards are comparable in both groups studied. (Figure 1) Most patients in group C belonged to the age group 31 -50 and the same applied to group D. The mean age in group D was 39.8 and in group C it was 36.1 Data suggests that with respect to demographic variables both groups studied were comparable (p = 0.143) (Figure 2)

In group D 80% patients belonged to ASA grade 1 and 20% belonged to ASA grade 2 .In group C 86.7% belonged to ASA grade 1 and 13.3% to ASA grade 2 suggesting that both groups were comparable with respect to ASA grade.

Mean heart rate at baseline was 80.0 ± 9.6 in group D while in group C it was 81.8 ± 8.7 .At 5 min heart rate was 72.9 ± 13.7 in group D and in group C it was 66.3 ± 13.1. The fall in HR though steeper in group C was not statistically significant.

(p= .060). However the mean HR at 15 min was 69.4 ± 10.8 in group D which was significantly higher than 63.6 ± 8.9 in group C thus confirming that fall in HR was much steeper in group C compared to group D. The mean heart rate at 30, 45, 60, 75, 90 minutes was comparable in both groups (p≥0.05).

The mean heart rate at 105,130 and 180 minutes were statistically higher in group D compared to group C suggesting a steeper rise in heart rate towards the latter part of surgery.

Thus both fall and rise in heart rate following spinal anesthesia was more gradual in group D compared to group C.(Figure 3)

The MAP at baseline was 96.8±5.2 in group D while in group C the baseline MAP was 94.7±7.1, the p value was 0.193 suggesting that baseline MAP was comparable in both groups. In both groups following spinal anesthesia a fall in MAP was recorded with the lowest reading at approximately same time i.e., around 30 minutes. At 15 minutes, the fall in MAP was steeper in group C (75.6±14.5) compared to group D (82.6±12.1) and this difference was statistically significant (p=0.046). MAP values were comparable at 45,60,90.105,120 minutes. At 135 minutes the MAP of group D was 88.6±7.7 while in group C it was 92.9±6.6 suggesting a steeper rise in MAP in group C compared to group D (p=o.o23).Thus it is safe to assume that rise and fall in MAP is relatively steeper in group C compared to group D.MAP values at 150,165 and 180 minutes were comparable. (Figure 4)

In both groups 20% of the total study population developed bradycardia which warranted the use of atropine suggesting that clinically, use of the study drug was not associated with undue adverse effect of bradycardia (p = 1.0)

Though ephedrine requiring hypertension was found to be more in group C compared to group D (23.3% vs 6.7%) the difference was clinically insignificant (p = 0.071).

In group D highest level of block achieved was T3 while in group C it was T4 .Highest percentage of patients ie 33% attained a highest level of T4 in group D while in group C 33% attained a highest dermatomal level of T4.The highest sensory level attained by 36.7% of study population in group C was T6.(Figure 5)

In group D 56.7% of patients had a sensory block duration of 121-180 min while 36.7% showed a duration of 60-120 min and in 6.7% patients the block lasted for more than 180 min whereas in group C the block duration in 96.7% patients was in the 60-120 min range and in none of the patients the block exceeded 180 min. On taking mean values, block duration was found to be significantly higher in group D compared to group C (135.0 vs 77.7) (p<0.001). (Table 1;Figure 6)

In group D 80% of subjects showed motor block duration in the 121-180 range while in 20% it lasted more than 180 min. In group C motor block lasted for 121-180 min in 20 % and in 80% subjects it was in the 60-120 min range. Taking the means, motor block duration in group D was significantly higher in group D than in group C (173.3 vs 132.7) (p<0.0010). (Table 2; Figure 7)

The time to first request for post operative analgesia in 20.0% of patients in group D was between 181 to 240 minutes, and 241 to 300 minutes in 53.33% patients. The time to first request for post operative analgesia in 86.67% of patients from group C was between 121 to 180 minutes, and 181 to 240 minutes in 6.67% patients. All patients in group C required rescue analgesic in less than 240 minutes whereas 20.00% patients in group D requested for rescue analgesia after 300 minutes. The study showed that time for request of post operative rescue analgesia was significantly prolonged in group D (264.0 ± 49.0) compared to group C (150.0 ± 24.0) (P = <0.0001). (Table 3; Figure8)

Only 3.3% of patients in group D showed a sedation score of 4 and the rest (96.7%) had a sedation score of 3 whereas in group C the sedation score for all patients was 2.So sedation was significantly higher in group D(p <0.0001). (Table 4)

Figure 1 Sex Distribution

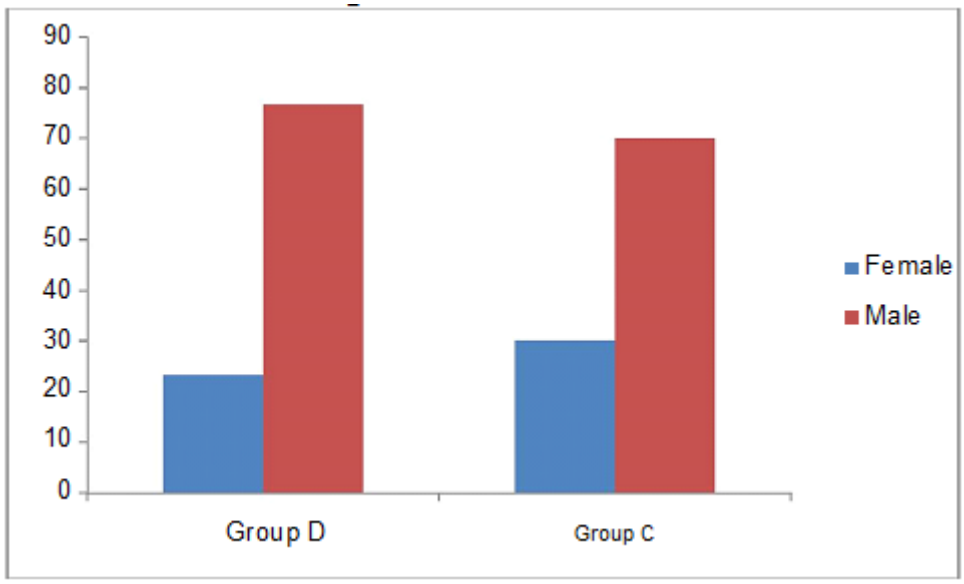


Fig. 2. Age Distribution

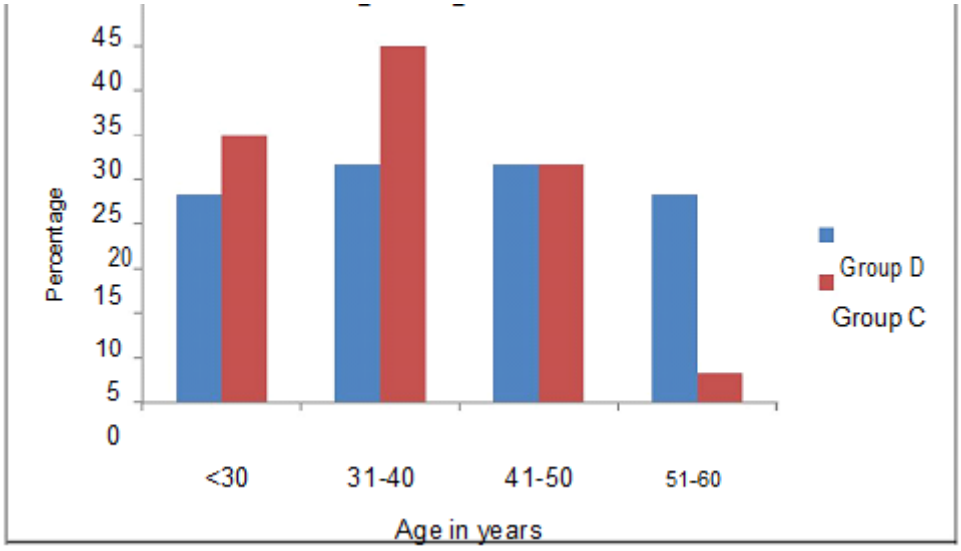


Fig. 3 Hemodynamic Parameters - Heart Rate

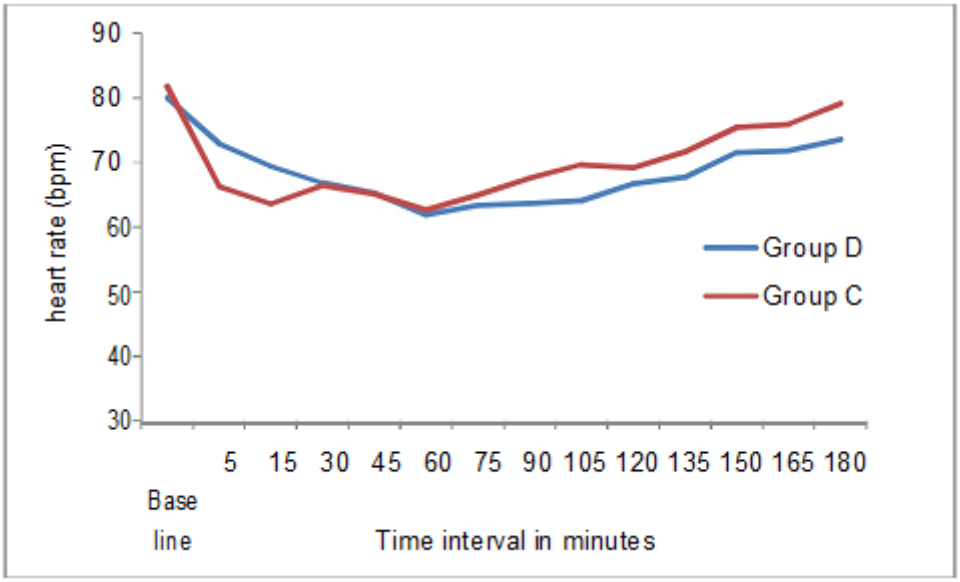


Fig. 4 Hemodynamic Parameters – Mean Arterial Pressure

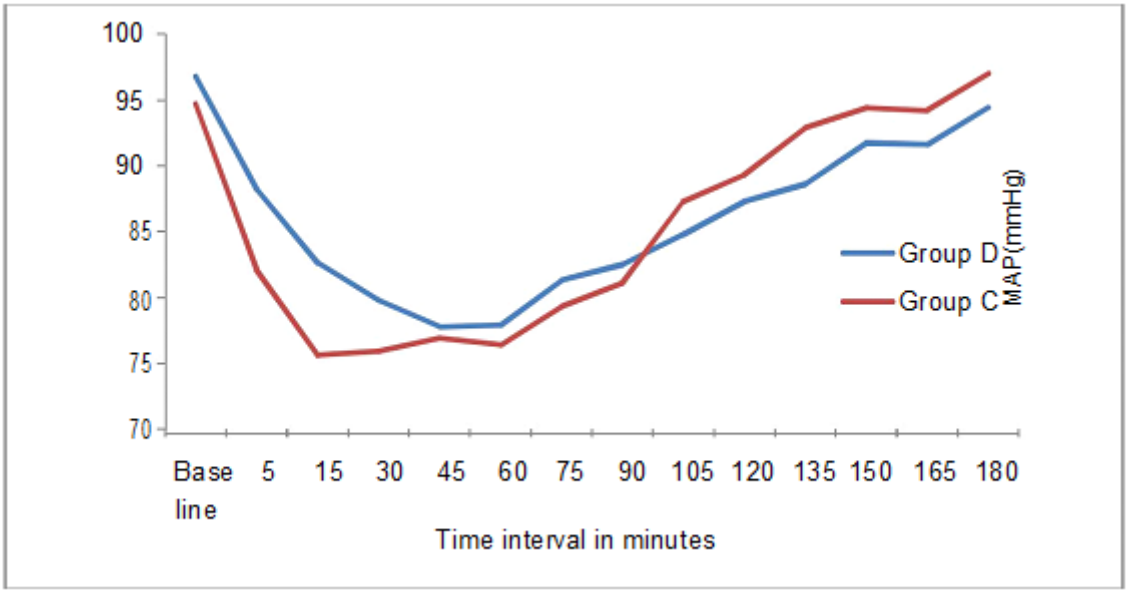
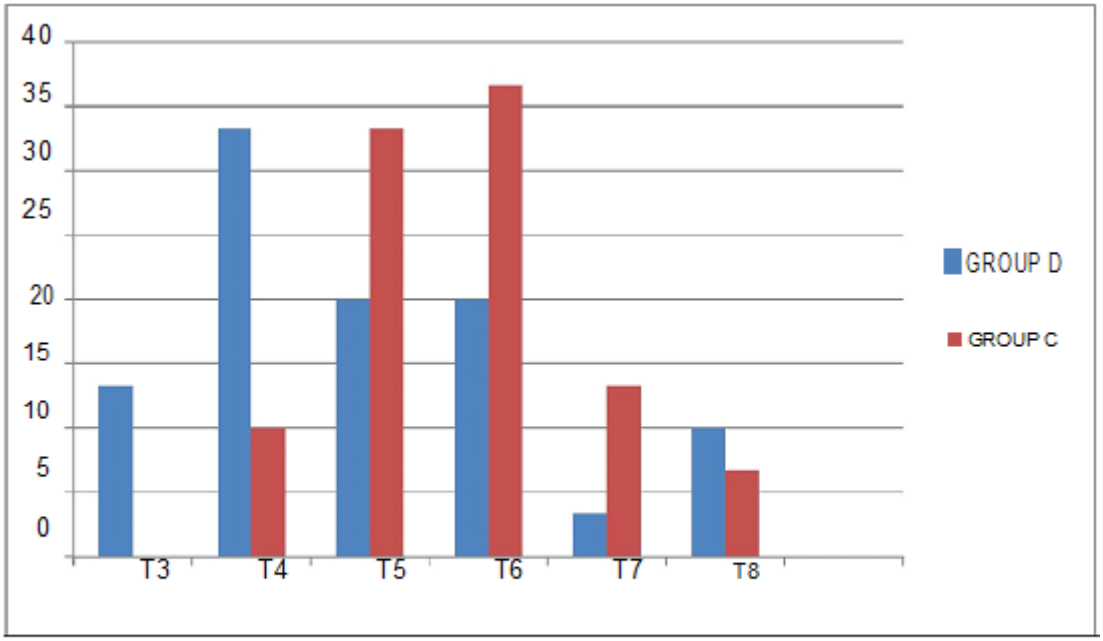


Fig. 5 Level of Sensory Block



MannWhitney U test p <0.001

Table 1 Time for two dermatomal regression of sensory blockade

CATEGORY	N	Duration of sensory block in minutes		t	P
		Mean	sd		
Group D	30	135.0	23.9	11.815	<0.001
Group C	30	77.7	11.7		

Fig. 6 Duration of Sensory Block

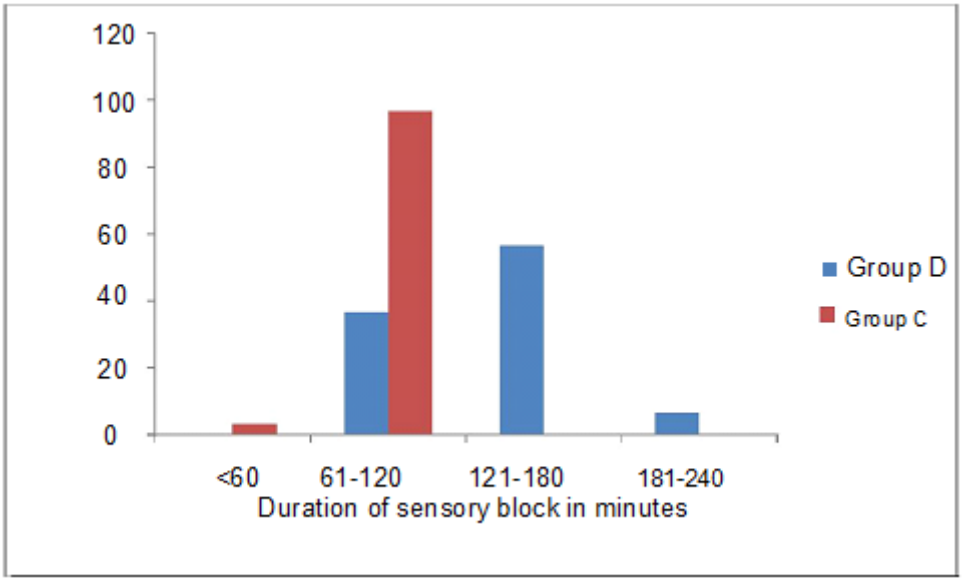


Fig. 7 Duration of Motor Block

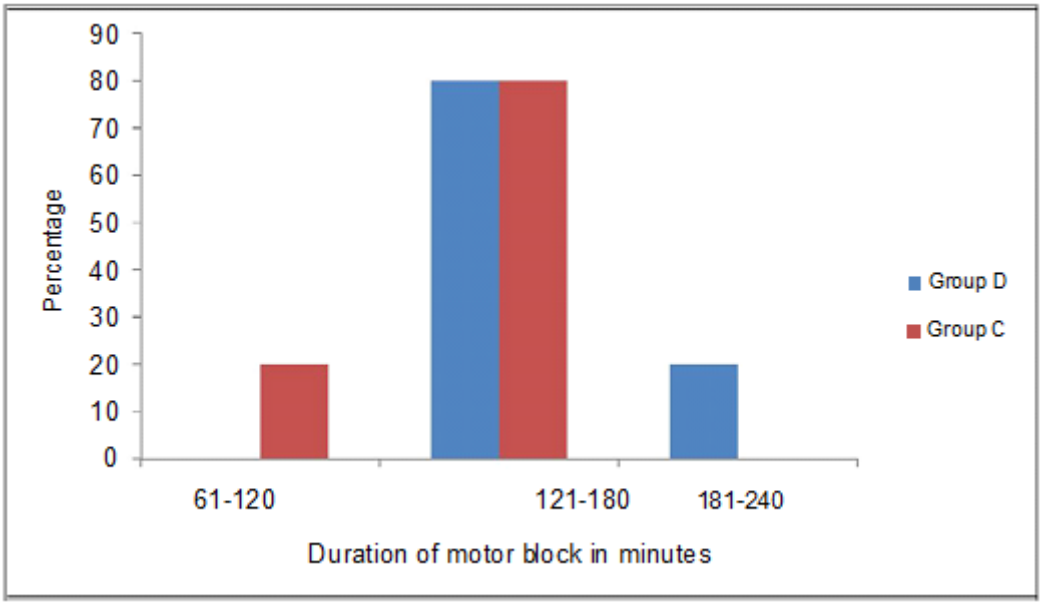


Table 2 Time for return to Modified Bromage **scale 1**

Category	N	Duration of Motor block in minutes		T	P
		Mean	sd		
Group D	30	173.3	22.2	9.132	<0.0010
Group C	30	132.7	10.1		

Table. 3 Comparison of mean values of time to rescue analgesia

CATEGORY	N	Time at request for first post operative analgesia		t	P
		Mean	sd		
Group D	30	264.0	49.0	11.440	<0.0001
Group C	30	150.0	24.0		

Fig. 8 Time at request for first post operative analgesia

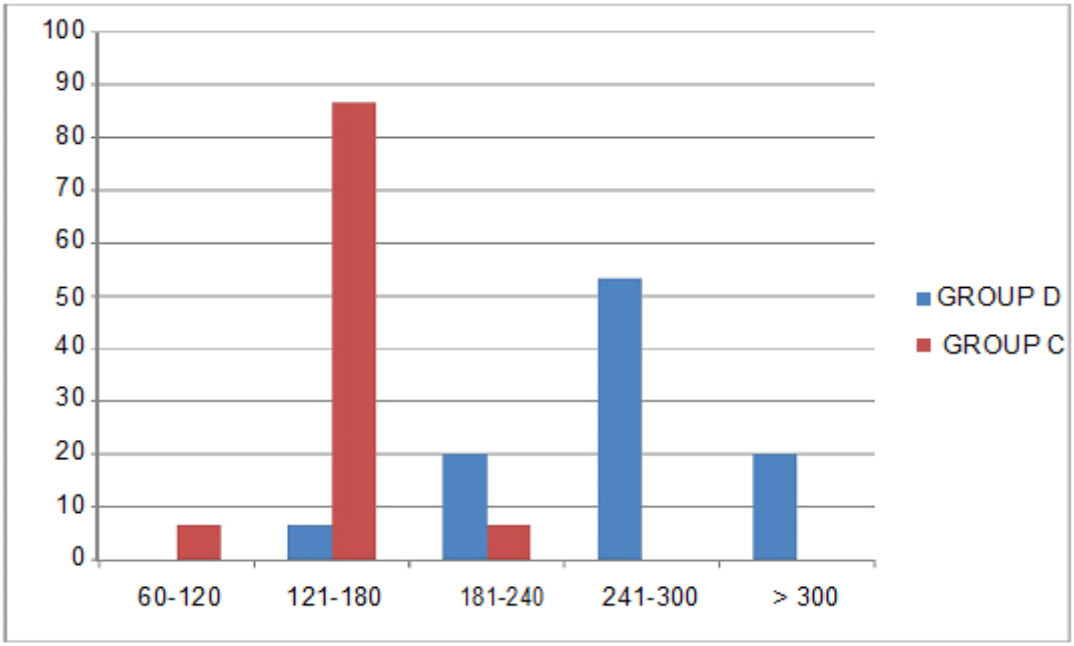


Table 4 Comparison of sedation scores

Sedation score	Group D		Group C		Total	
	N	%	N	%	N	%
<4	29	96.7	30	100.0	59	98.3
=4	1	3.3	0	.0	1	1.7
Total	30	100.0	30	100.0	60	100.0

Mann-Whitney U Test p <0.001

Discussion

This one year quasi interventional study was conducted under the Dept of Anaesthesia at Govt. Medical College Thiruvananthapuram, on patients undergoing lower limb surgeries. A total of 60 patients undergoing lower limb surgeries were divided, on an alternate basis, into 2 groups, group D (N=30) received 0.1 µG/kg of iv dexmedetomidine over 10 minutes followed by an infusion of 0.5µg/kg for the duration of surgery while group C (N=30) received normal saline at same rates via infusion pumps. The lower HR could be explained by the decreased sympathetic outflow and circulating levels of catecholamines that are caused by Dexmedetomidine.

Rapid or bolus administration of Dexmedetomidine is known to produce sudden hypertension and bradycardia as long as the central sympatholytic effect dominates, resulting in moderate decreases in both MAP and HR from baseline.

The bradycardia commonly seen following administration of α_2AR agonists may be due to the central sympatholytic action of these drugs leaving vagal tone unopposed. It can also be attributed to presynaptic-mediated reduction of NE release or a direct vagomimetic action[8] Although bradycardia can be a problem with the administration of α_2AR agonists, Dexmedetomidine has been shown to protect against adrenaline-induced arrhythmia during halothane anaesthesia in dogs. This anti-arrhythmic action is supposedly due to stimulation of imidazoline receptors[9]

In the present study, no biphasic change or significant cardiovascular variability was observed. This might be attributed to sympathetic blockade associated with spinal anaesthesia, slow rate of administration, and sufficient preoperative hydration. Al-Mustafa et al concluded that intravenous Dexmeditomidine administration prolonged the sensory and motor blocks of bupivacaine spinal analgesia with good sedation effect and hemodynamic stability .Adverse side effects were avoided by the slow infusion of loading and the maintenance dose of Dexmedetomidine. All patients reached good sedation levels that enabled their cooperation and better operating conditions for the surgeons without significant respiratory depression. This decrease in the heart rate was more clear and significant in patients receiving intravenous Dexmedetomidine in comparison with those receiving normal saline. The incidence of bradycardia requiring treatment with atropine was higher in group D (23.3%) than in group C (20.0%). However, this difference was statistically not significant (p=0.754).

In the present study, The MAP at baseline was 96.8±5.2 in group D while in group C the baseline MAP was 94.7±7.1. The p value was 0.193 suggesting that baseline MAP was comparable in both groups. In both groups following spinal anesthesia a fall in MAP was recorded with the lowest reading at approximately same time, that is around 30 minutes. At 15 minutes, the fall in MAP was steeper in group C (75.6±14.5) compared to group D (82.6±12.1) and this difference was statistically significant (p=0.046). Thus it is safe to assume that rise and fall in MAP is relatively steeper in group C compared to group D. MAP values at 150,165 and 180 minutes were comparable.

Biphasic cardiovascular response has been described after the administration of Dexmedetomidine. A bolus of 1 µg/kg results in a transient increase in blood pressure (BP) and a reflex decrease in heart rate (HR), especially in the young healthy patients. This initial response results from the direct effects of alpha$_2$B-adrenoceptor stimulation of vascular smooth muscle. This response can be minimized by a slow infusion over 10 min,[10] but even at slower infusion rates, the transient increase in mean BP and the decrease in HR over the first 10 min is shown. This initial response lasts for 5 to 10 min, followed by a decrease in BP of 10-20% below baseline and by stabilization of the HR below baseline values. Both these effects are in all probability caused by an inhibition of central sympathetic outflow that overrides the direct effects of Dexmedetomidine on the vasculature. Hypotension and bradycardia induced by Dexmedetomidine are reversed by ephedrine and atropine respectively, but large doses may be needed. Postsynaptic activation of central α_2-ARs results in sympatholytic effect resulting in hypotension and bradycardia, an effect judiciously used to attenuate the stress response of surgery.

In the present study, no biphasic change or significant cardiovascular variability was observed. This might be attributed to sympathetic blockade associated with spinal anaesthesia, slow rate and low dose of administration, and sufficient preoperative hydration.

The frequency of ephedrine requirement in the present study was more in group C (23.33%) compared to group D (6.67%) but this difference was statistically not significant. In a study.2/25

patients in Dexmedetomidine group and 4/25 patients in Saline group developed hypotension. Mahmoud et al, in their study found the incidence of hypotension to be comparable in both groups.

In the present study, oxygen saturation in both the groups was found to be comparable at all time intervals. A study[3] observed no respiratory depression in any patient and respiratory parameters (respiratory rate, SpO2, and Et-CO2) remained within normal limits at all stages of the procedure. Al Mustafa et al reported that the oxygen saturation was higher than 95% in all patients in the two groups either in the intraoperative as also in the PACU period.

In the present study a Ramsay sedation score of more than 4, suggesting excessive sedation was noted in 3.33% patients in group D whereas, all the patients (100%) in group D had Ramsay sedation scores of 2 ($p<0.0001$).10 % of patients in group D had a ramsay sedation score of 4. It is important to note that even with excessive sedation (score of more than 4), the oxygen saturation remained comparable to the placebo group, suggesting that Dexmedetomidine produces sleep, without ventilatory depression, making Dexmedetomidine a near ideal sedative. The sedation produced by Dexmedetomidine differs from other sedatives, as patients may be easily aroused and remain cooperative. A study[11] reported excessive sedation in 2/25 patients in Dexmedetomidine group and 5/25 in midazolam group compared to no incidence in the saline group.

The hypnotic and supraspinal analgesic effects of Dexmedetomidine are mediated by the hyperpolarization of noradrenergic neurons, which suppresses neuronal firing in the locus ceruleus along with inhibition of norepinephrine release and activity in the descending medullospinal noradrenergic pathway, secondary to activation of central α2-ARs. This suppression of inhibitory control triggers neurotransmitters that decrease histamine secretion producing hypnosis similar to normal sleep, without ventilatory depression, making Dexmedetomidine a near ideal sedative. Suppression of activity in the descending noradrenergic pathway, which regulates nociceptive neurotransmission, terminates propagation of pain signals leading to analgesia.[12] Most of the patients (33.33 %) in group D had T4 level of the sensory block compared to T6 in group P (36.67%). Sensory block level achieved was higher ($p<0.001$) in group D than in group P .These findings can be correlated to a study[11] where they recorded the highest level of sensory block to be significantly higher ($p<0.001$) in Dexmedetomidine group (T4.6±0.6) than saline group (T6.4±0.8).

In group D 56.7% of patients had a sensory block duration of 121-180 min while 36.7% showed a duration of 60-120 min and in 6.7% patients the block lasted for more than 180 min whereas in group C the block duration in 96.7% patients was in the 60-120 min range and in none of the patients the block exceeded 180 min. On taking mean values, time for two dermatomal regression of sensory blockade was found to be significantly higher in group D compared to group C (135.0 vs 77.7) ($p<0.001$). These results are consistent with the results obtained in a study[11] using intravenous Dexmedetomidine. A double blind randomized placebo controlled trial was designed to compare the effects of intravenous Dexmedetomidine with midazolam and placebo on spinal block duration, analgesia, and sedation in patients undergoing transurethral resection of the prostate on 75 American Society of Anesthesiologists' I and II patients. Patients received Dexmeditomedine 0.5 µg/kg, or saline intravenously before spinal anaesthesia with bupivacaine 0.5%, 15mg (n=25 per group). Sensory block was higher with Dexmeditomidine (T4.6±0.6) than with midazolam (T6.4±0.9; $P<0.001$) or saline (T 6.4±0.8; $P<0.001$). Time for sensory regression of two dermatomes was 145± 26 min in the Dexmeditomidine group, longer ($p<0.001$) than in midazolam group (106±39 min) or the saline (97±27) groups. Duration of motor block was similar in all groups. Dexmedetomidine also increased the time to first request for postoperative analgesia ($p<0.01$) compared with midazolam and saline, and decreased analgesic requirements ($p<0.05$). The maximum Ramsay

sedation score was greater in the Dexmedetomidine and midazolam groups than in the saline group ($p<0.001$). Authors concluded that, intravenous Dexmedetomidine, but not midazolam, prolonged spinal bupivacaine sensory blockade and it also provided sedation and analgesia.

In group D 80% of subjects showed motor block duration in the 121-180 range while in 20% it lasted more than 180 min. in group C motor block lasted for 121-180 min in 20 % and in 80% subjects it was in the 60-120 min range. Taking the means, regression to Modified Bromage scale 2 was found to be significantly prolonged in group D than in group C (173.3 vs 132.7) ($p<0.0010$). These results are consistent with the results obtained in a study using intravenous Dexmedetomidine.

So, based on present and previous studies it is safe to comment that the effect of dexmedetomidine on duration of spinal and motor blockade is not dependent on route of administration. However, an intravenous route promises a safer and effective adjunct to spinal anaesthesia. A drawback of Dexmedetomidine supplemented spinal block characteristics may be an increase in the duration of motor block, which may not suit ambulatory procedures.

A study[13] revealed that Dexmedetomidine has an inhibitory effect on the locus ceruleus (A6 group located at the brain stem. This supraspinal action could possibly explain the prolongation of spinal anaesthesia after intravenous administration of Dexmedetomidine. The noradrenergic innervation of the spinal cord arises from the noradrenergic nuclei in the brain stem including the locus ceruleus, the A5, and the A7 noradrenergic nuclei. Neurons in the locus ceruleus are connected to the noradrenergic nuclei located in the brain stem. Axon terminals of the noradrenergic nuclei reach lamina VII and VIII of the ventral horns of the spinal cord. The activity of the noradrenergic neurons is decreased by agonists acting at α_2- adrenergic receptors on the locus ceruleus cell bodies. Therefore, inhibition of the locus ceruleus results in disinhibition of the noradrenergic nuclei and exerted descending inhibitory effect on nociception in the spinal cord.

In our study it was found that the time to first request for post operative analgesia in 20.0% of patients in group D was between 181 to 240 minutes, and 241 to 300 minutes in 53.33% patients. The time to first request for post operative analgesia in 86.67% of patients from group C was between 121 to 180 minutes, and 181 to 240 minutes in 6.67% patients. All patients in group C required rescue analgesic in less than 240 minutes whereas 20.00% patients in group D requested for rescue analgesia after 300 minutes. The study showed that time for request of post operative rescue analgesia was significantly prolonged in group D (264.0 ± 49.0) compared to group C (150.0 ± 24.0) ($P = <0.0001$).these findings are consistent with the results obtained in a similar study[14] done to establish that intravenous dexmedetomidine and not midazolam prolongs spinal bupivacaine anaesthesia. Authors recorded the time to first request for rescue analgesia was 216±43 minutes in Dexmedetomidine group, which for significantly later ($p<0.001$) than the saline group (122±34 minutes). In the spinal cord, activation of both α2-C and α2-ARs, which are situated in the neurons of superficial dorsal horn (especially lamina II), directly reduces pain transmission by reducing the release of pro-nociceptive transmitter, substance P and glutamate from primary afferent terminals and by hyperpolarizing spinal interneurons via G-protein-mediated activation of potassium channels. Suppression of activity in the descending noradrenergic pathway, which modulates nociceptive neurotransmission, terminates propagation of pain signals resulting in analgesia.

Conclusion

The present study showed that intravenous dexmedetomidine as intravenous bolus and continuous iv infusion prolonged the duration of sensory and motor blockade in spinal bupivacaine anaesthesia. It provided conscious sedation without respiratory depression and maintained a stable

hemodynamic profile .It also prolonged the time of request for rescue analgesia.

Limitation of study

A limitation of this study is that it used need for rescue analgesia as the primary index for post operative analgesia rather than the VAS scores. This study also predicts a shortcoming in the use of Dexmedetomidine for this purpose, in view of prolongation of motor blockade which is undesirable postoperatively and a cause for patient anxiety. This is of particular importance in daycare surgeries.

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