Original Research Article

Indian Journal of Anesthesia and Analgesia
May – June 2020; 7(3): 764–773
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7320.17

A Comparative Study of Intravenous Dexmedetomidine Versus Intrathecal Dexmedetomidine With Heavy Bupivacaine in Spinal Anaestheia

Nagaraj Gajagouni[1], CH Nagaraju[2]

[1,2]Assistant Professor, Department of anesthesia, MNR Medical College and Hospital, Sangareddy, Telangana 502285, India.

Abstract

Introduction: Dexmedetomidine is a highly selective α2 adrenoceptor agonist recently introduced to anesthesia. It produces dose dependent sedation and analgesia without respiratory depression. The purpose of this study was to compare the effect of intravenous versus intrathecal low dose dexmedetomidine on bupivacaine spinal block in patients undergoing lower abdomen and lower limb surgeries. *Methodology:* This prospective randomized clinical study was conducted on 60 patients of age 20 to 60 years posted for elective lower abdomen and lower limb surgeries. All patients were divided into 3 groups of 20 each. *Results:* Three groups were demographically comparable. Onset of sensoryblockade was statistically not significant between the three groups. Onset of motor blockade was not statistically significant between group A and B but statistically significant when compared with group C. Duration of sensory blockade, duration of analgesia and two segment regression time were significantly prolonged in group A followed by group B when compared with group C. Duration of motor blockadewas significantly prolonged in group Awhen compared with group B and group C. *Conclusion:* Dexmedetomidinewhen administered intravenously or intrathecallyalong with intrathecal hyperbaric bupivacaine produced a significant prolongation in the duration of sensory and motor block, but that administered intrathecally produced more significant prolongation of effect than that administered intravenously, with preserved hemodynamic stability and satisfactory arousable sedation.

Keywords: Intrathecaldexmedetomidine, Spinal anaesthesia, heavy bupivacaine

How to cite this article:
Nagaraj Gajagouni, CH Nagaraju . A Comparative Study of Intravenous Dexmedetomidine Versus Intrathecal Dexmedetomidine With Heavy Bupivacaine in Spinal Anaestheia. Indian J Anesth Analg. 2020;7(3):764–773.

Introduction

Perioperative pain management has been a major challenge for anaesthesiologists and there has been a constant struggle to bring out the best possible analgesic technique with least side effects. Regional anaesthesia and analgesia has the potential to provide excellent operating conditions and prolonged Postoperative pain relief.[1] However, post- operative pain control is a major problem because spinal anaesthesia using only local anesthetics is associated with relatively short duration of action and thus early analgesic intervention is needed in post-operative period. Various adjuncts such as benzodiazepines, Opioids, ketamine, neostigmine and many other drugs have

Corresponding Author: **CH Nagaraju,** Department of anesthesia, MNR Medical College and Hospital, Sangareddy, Telangana 502285, India.
E-mail: : ch.nagaraj211@gmail.com
Received on 22.01.2020, **Accepted on** 29.02.2020

been used with local anesthetics to provide better Post- operative analgesia, thereby facilitating rehabilitation and accelerating functional recovery. But these adjuvants (especially opioids) are associated with side effects which limit their use.

Dexmedetomidine is a highly selective α2-adrenoceptor agonist recently introduced to anesthesia. Administration of α2-agonists through the intrathecal route by acting as an adjuvant drug to local anesthetics provided an analgesic effect in postoperative pain without sedation. They potentiate the effect of the local anesthetic and allow a decrease in the required doses. Its addition to local anesthetics prolongs the duration of both sensory and motor spinal blockade.[2] Dexmedetomidine when added to intrathecal bupivacaine resulted in prolongation of the duration of spinal anesthesia. When dexmedetomidine was given intravenously before spinal anesthesiaor as a single intravenous dose after spinal anesthesia[3], it also lengthened the duration of spinal anesthesia. The purpose of this study was to compare the effect of intravenous versus Intrathecal low dose dexmedetomidine on bupivacaine spinal block in patients undergoing lower limb and lower abdomen surgeries.

Materials And Methods

After obtaining institutional ethical clearance and written informed consent from the patients, a prospective, randomized comparative study was conducted in 60 patients of ASA grade 1 and 2 aged between 18 and 60 years of either sex posted for elective lower limb and lower abdominal surgeries in the Department of anesthesiology, at MNR Medical College and Hospital, Sangareddy. 60 patients were divided into three groups of 20 patients each.

Exclusion Criteria: Age less than 18yrs or greater than 60yrs, Patient refusal, Emergency surgeries, Known case of hypersensitivity reactions to drugs, Patients with medical complications like anemia, heart disease, severe hypovolemia, shock, septicaemia, hypertension,Local infection at the site of proposed puncture for spinal anesthesia.

Preanaesthetic examination and preparation: Pre-anestheticcheckup was done one day prior to the surgery. Patients were evaluated for any systemic diseases and laboratory investigations recorded. The procedure of subarachnoid block was explained to the patient and informed written consent was obtained for the same.

After meeting inclusion criteria and taking written valid and informed consent, 60 patients were randomly divided into 3 groups of 20 each

Group A: (n = 20) were injected with 10 ml isotonic saline intravenously over 5 min in supine position immediately after patient has received intrathecal hyperbaric bupivacaine 15 mg and intrathecaldexmedetomidine 5µg.

Group B: (n = 20) were injected with dexmedetomidine 0.5 µg/kg intravenously diluted in 10 ml isotonic saline over 5 min in the supine position immediately after patient has received intrathecalhyperbaric bupivacaine 15mg.

Group C: control group (n = 20) were injected with 10 ml isotonic saline intravenously over 5 min in the supine position immediately after patient has received intrathecal hyperbaric bupivacaine 15mg.

After shifting patients to operating room, IV access was obtained on the forearm with No 18G cannula. All subjects were preloaded with 20ml/kg of ringer lactate solution over 10min. Baseline hemodynamic parameters were noted after applying standard monitors (pulse oximetry, NIBP and ECG). Patients were placed in the sitting position and a 25-G Quincke needle was placed in the L3–L4 or L4–L5 interspaces for spinal block.

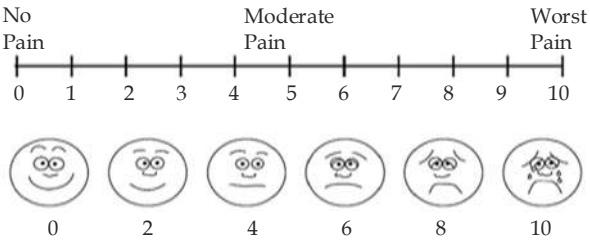
Under strict aseptic conditions, group-A were injected with 10 ml isotonic saline intravenously over 5 min in supine position immediately after patient has received intrathecal hyperbaric bupivacaine 15 mg and dexmedetomidine 5µg; group-B were injected with dexmedetomidine 0.5 µg/kg intravenously diluted in 10 ml isotonic saline over 5 min in the supine position immediately after patient has received intrathecal hyperbaric bupivacaine; group-C (control group) were injected with 10 ml isotonic saline intravenously over 5 min in the supine position immediately after patient has received intrathecal hyperbaric bupivacaine 15mg. Intraoperatively, the parameters monitored included Onset of sensory blockade, Onset of motor blockade, Duration of sensory blockade, Duration of motor blockade, Maximum dermatome level of sensory blockade, Duration of analgesia, Hemodynamic changes like SpO_2, heart rate, systolic blood pressure, diastolic blood pressure, Mean blood pressure. All the parameters were recorded at 0, 1, 3, 5, 10, 20, 30, 45, 60, 120 &180 min

following block.Level of sedation was observed at 15, 30, 45, 60, 75, 90,105, 120, 135, 150, 165,180 minutes after injection of spinal drug (by using Ramsay sedation score)

Ramsay sedation scale

1. Agitated, restless
2. Cooperative, tranquil
3. Responds to verbal commands while sleeping
4. Brisk response to glabellar tap or loud noise while sleeping
5. Sluggish response to glabellar tap or loud noise while sleeping
6. No response to glabellar tap or loud noise while sleeping

Pain was assessed using "visual analogue scale" advocated by Revill and Robinson in 1976. It is linear scale, consists of 10 cm line anchored at one end by a label such as "No pain" and other end by Worst pain imaginable". Intravenous tramadol 100mg was given when the VAS was at least 3 or upon patient's request.



Visual Analogue Scale was considered as 0 = no pain, 10 = severe pain

Statistical Analysis

Data was entered into Microsoft Excel and statistical analysis were done using IBM SPSS Statistics for Windows. Level of significance was set at $p < 0.05$. A "p" value less than 0.05 was considered as the minimum value for statistical significance. p value <0.0001 was considered to be highly significant. Demographic data like age and weight were compared using student's t test. Sex distribution was compared using Pearson Chi Square test.

Results

The two study groups (A-IT and B-IV) were comparable with regard to age, sex, and preoperative hemodynamics.

Age was comparable between the three groups (Table 1). The mean age was 46.65 ± 9.37 for the GROUP A, 44.9 ± 7.66 for the GROUP B, and 43.45 ± 9.24 for the GROUP C ($p = 0.646$). The subjects in study were comparable with regard to their ASA grade and gender.

All the basal vitals (parameters) (Table 2) were comparable in the study groups except in the SpO_2 levels where we found a little variation [$p = 0.01$].

There was no statistically significant differencein thetimetaken for the onset of sensory blockade between any two groups ($p > 0.05$) (Table 3).

Table 1: demographic data

Parameters	Group A- IT (n=20)	Group B-IV (n=20)	Group C-CONTROL (n=20)	*p*
	Mean +SD	Mean +SD	Mean +SD	
AGE (in Years)	46.65 +9.37	44.9 +7.66	43.45 +9.24	0.260
ASA Status				
ASA I	13	14	14	0.925
ASAII	7	6	6	
Gender				
Male	11	8	11	0.548
Female	9	12	9	

Table 2: Pre-subarachnoid block (basal) vital parameters

Basal Parameters	Group A-IT (n=20)		Group B-Iv (N=20)		Group C- Control (N=20)		*p*
	Mean	SD	Mean	SD	Mean	SD	
PR (Per Min)	77.20	9.96	82.10	9.71	84.70	16.27	0.123
SBP (mmHg)	128.70	12.65	131.45	13.28	126.80	14.16	0.506
DBP (mmHg)	82.10	8.25	84.30	8.77	80.90	8.42	0.418
RR	20.80	2.86	22.05	4.31	21.25	2.90	0.286
SPO2	99.60	0.75	98.80	1.11	99.35	0.81	0.01

Table 3. Comparision of sensory and motor blockade characteristics

Parameters	Group A-IT (N=20)		Group B-IV (N=20)		Group C (N=20)		*p* value		
	Mean	SD	Mean	SD	Mean	SD	A& B	A & C	B & C
Onset of sensory blockade in mins	2.6	0.66	2.85	0.95	3.06	1.02	0.367	0.129	0.619
Onset of motor blockade in mins	8.15	0.96	8.5	1.37	11	1.85	0.365	< 0.00001	0.00038
Two dermatome sensory regression in mins	171	15.61	144	12.83	96	13.63	0.00004	< 0.00001	< 0.00001
Duration of sensory blockade in mins	450	13.38	342.7	12.66	220.5	15.47	< 0.00001	< 0.00001	0.00035
Duration of motor blockade in mins	419	15.78	196	14.74	184.8	17.05	< 0.00001	< 0.00001	0.081

There was no statistically significant difference in thetime taken for the onset of motor blockade between Group A and B (p = 0.365). However, it was statistically highly significant between group Aand group C (p < 0.00001) and also between group B and group C (p = 0.00038).

The mean time taken for regression of sensory block by two dermatomes (TDSR) was statistically highly significant between any two groups. (p = 0.00004 between A and B groups, $p \leq$ 0.00001 between A and C groups, $p \leq$ 0.00001 between B and C groups).

There was a statistically highly significant difference in the duration of sensory blockade when inter group analysis was conducted. ($p \leq$ 0.0001 between A and B groups and also A and C groups; p = 0.00035 between B and C groups). The duration of sensory blockadewas more in the A group, followed by the B group and the C group.

There was a statistically highly significant difference in the duration of motor blockade between group A and group B (p < 0.00001) and group A and group C (p < 0.00001) but there was no statistically significant difference between the group B and group C (p = 0.081).

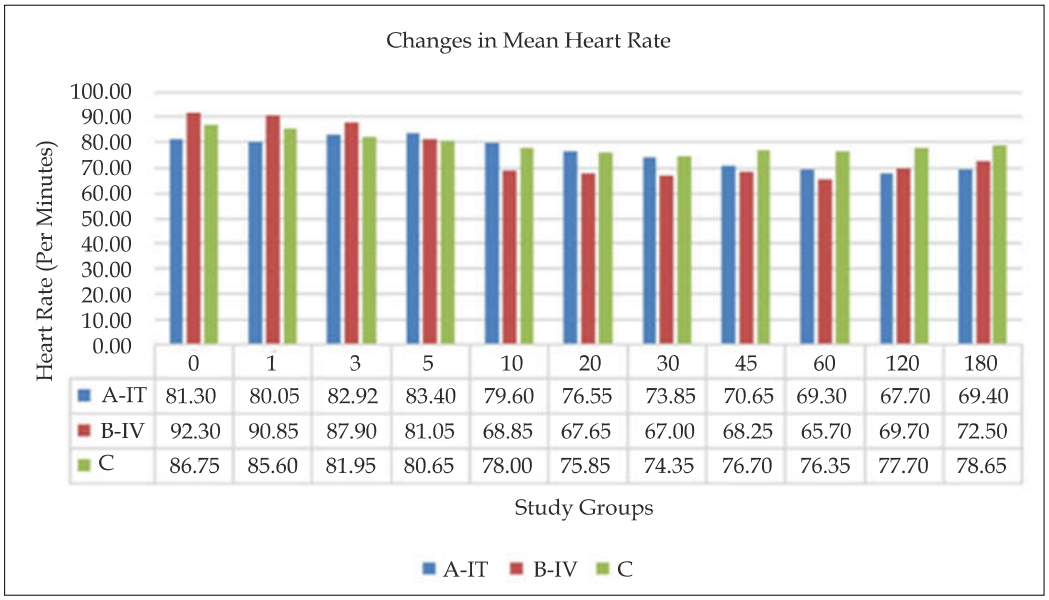
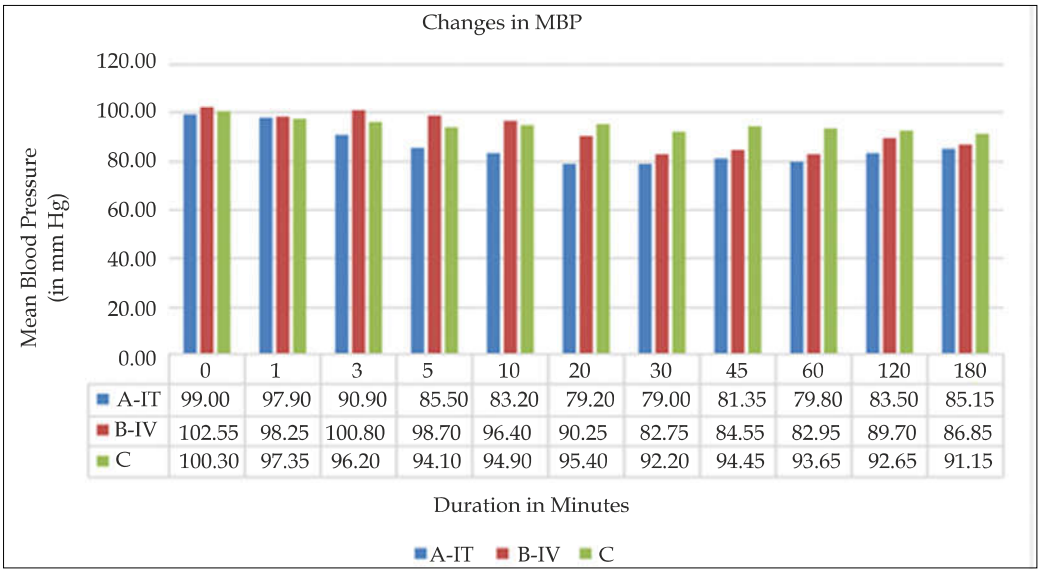
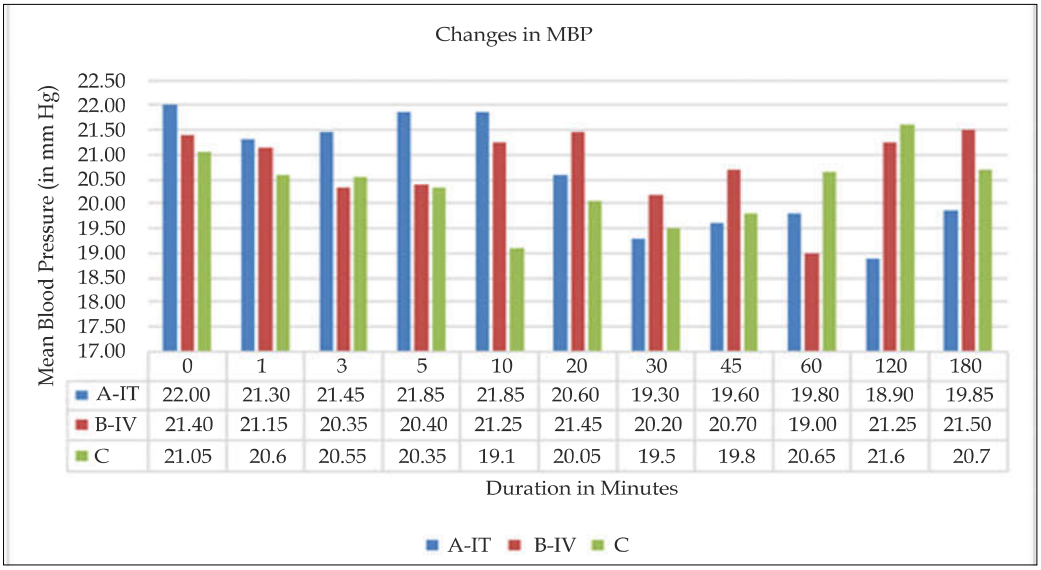


Fig. 1: Changes in mean heart rate



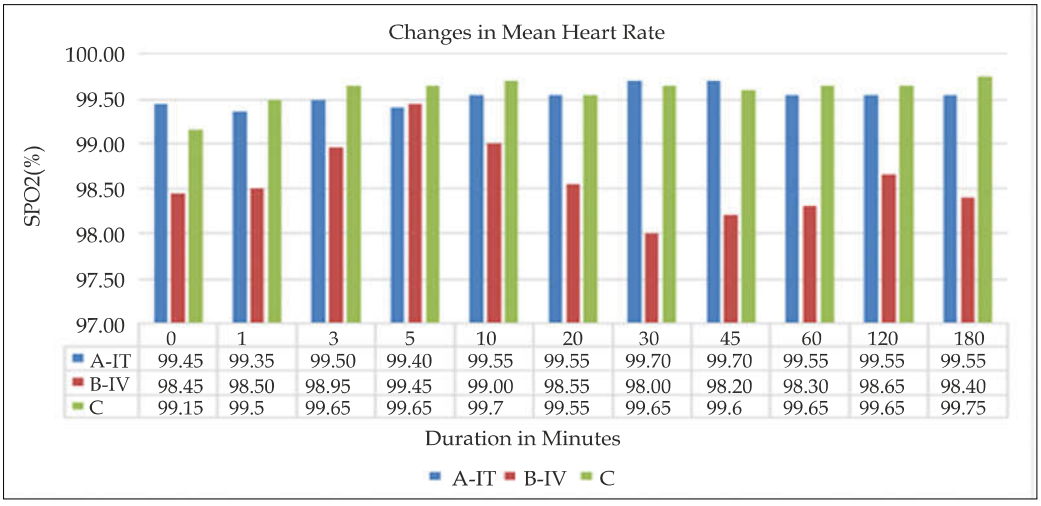
	0	1	3	5	10	20	30	45	60	120	180
A-IT	99.00	97.90	90.90	85.50	83.20	79.20	79.00	81.35	79.80	83.50	85.15
B-IV	102.55	98.25	100.80	98.70	96.40	90.25	82.75	84.55	82.95	89.70	86.85
C	100.30	97.35	96.20	94.10	94.90	95.40	92.20	94.45	93.65	92.65	91.15

Fig. 2: Changes in mean arterial pressure



	0	1	3	5	10	20	30	45	60	120	180
A-IT	22.00	21.30	21.45	21.85	21.85	20.60	19.30	19.60	19.80	18.90	19.85
B-IV	21.40	21.15	20.35	20.40	21.25	21.45	20.20	20.70	19.00	21.25	21.50
C	21.05	20.6	20.55	20.35	19.1	20.05	19.5	19.8	20.65	21.6	20.7

Fig. 3: Changes in respiratory rate



	0	1	3	5	10	20	30	45	60	120	180
A-IT	99.45	99.35	99.50	99.40	99.55	99.55	99.70	99.70	99.55	99.55	99.55
B-IV	98.45	98.50	98.95	99.45	99.00	98.55	98.00	98.20	98.30	98.65	98.40
C	99.15	99.5	99.65	99.65	99.7	99.55	99.65	99.6	99.65	99.65	99.75

Fig. 4: Changes in SpO_2

We have noticed only two instances of bradycardia (1 each in group B and group C). However, none of them was clinically significant (Fig. 1).

The basal Mean Arterial Pressure (MAP) in the Group A was 99.00 mm Hg, 102.55mm Hg in the B-IV group, and 100.30mm Hg in the C group – all the groups were comparable (Fig. 2).

In the intergroup analysis, there were 2 instances of statistically significant difference between A and B groups (p = 0.04; 0.034), two instances of difference between B-IV and C groups (p = 0.031; 0.0001), at one instance between A-IT and C groups

Table 4. Adverse effects in present study

Adverse Event	A-IT	B-IV	Control
Only Hypotension	9	4	4
Only Bradycardia	0	1	1
Both Hypotension & Bradycardia	0	5	0

(p = 0.049). However, in none of the instances it was clinically significant (Fig. 3).

The basal SpO_2 in the A-IT group was 99.45%, it was 98.45% in the B-IV group, and 99.15% in the C group – all the groups were comparable at the basal level. On the inter and intra group analysis, we did not find any statistically and/or clinically significant differences (Fig. 4).

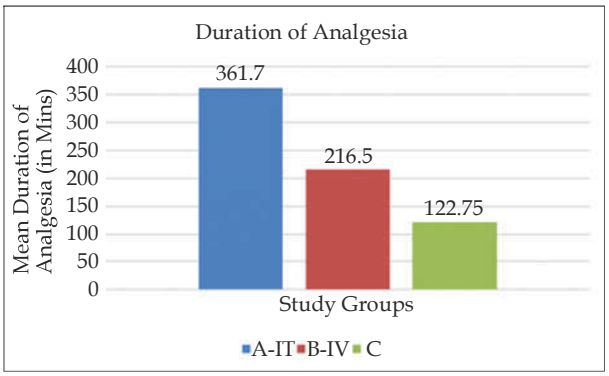


Fig. 5: Duration of analgesia

We have noted the incidents of Hypotension, Bradycardia, and in some patients both (Hypotension and Bradycardia). However, the occurrence of these events were neither statistically significant nor clinically significant. We did not notice any incident of intraoperative or postoperative nausea or vomiting in any of the three groups of patients (Table 4).

The mean duration of analgesia (the duration from the time of spinal anesthesia until the requirement of 1st rescue analgesia) [DOA] was 361.7 ± 39.89 minutes in the A-IT, 216 ± 27 minutes in the B-IV group, and 122.75 ± 15.85 minutes in the control group.

The intergroup analysis showed that there is statistically very significant difference between A and B groups (p < 0.00001), A and C groups (p < 0.00001), and B and C groups (p < 0.00001) (Fig. 5).

Table 5. Ramsey score distribution in groups

Ramsey Score Distribution (A-IT Group)	Ramsey 1	Ramsey 2	Ramsey 3	Ramsey 4
15 Mins	0	20	0	0
30 Mins	0	20	0	0
45 Mins	0	0	20	0
60 Mins	0	0	20	0
75 Mins	0	0	12	8
90 Mins	0	0	12	8
105 Mins	0	20	0	0
120 Mins	0	20	0	0
135 Mins	0	20	0	0
150 Mins	0	20	0	0
165 Mins	0	20	0	0
180 Mins	0	20	0	0
Ramsey Score Distribution (B-Iv Group)				
15 Mins	1	16	3	0
30 Mins	0	5	15	0
45 Mins	0	3	14	3
60 Mins	0	2	13	5
75 Mins	0	14	6	0
90 Mins	0	16	4	0
105 Mins	0	20	0	0
120 Mins	0	20	0	0
135 Mins	0	20	0	0
150 Mins	0	20	0	0
165 Mins	0	20	0	0
180 Mins	0	20	0	0
Ramsey Score Distribution (C Group)				
15 Mins	2	18	0	0
30 Mins	0	19	1	0
45 Mins	0	19	1	0
60 Mins	0	18	2	0
75 Mins	0	18	2	0
90 Mins	0	18	2	0
105 Mins	0	19	1	0
120 Mins	0	20	0	0
135 Mins	0	20	0	0
150 Mins	0	20	0	0
165 Mins	0	20	0	0
180 Mins	0	20	0	0

In the A-IT group, the patients had the RSS score of "3" (responded to commands) when it was measured at 45 minutes and 60 minutes, thereafter at 75 minutes and 90 minutes of measurement 60% (12) patients had the RSS of "3" and 40% (8) had the RSS of "4" (patients had a brisk response to a light glabellar tap or loud auditory stimulus). From 105 minutes until 180 minutes, the RSS settled to "2". None of the patient had the RSS of "1" at any point of measurement. All patients were in the state of satisfactory arousable sedation no evidence of respiratory depression. No patient crossed beyond Ramsey Score 4 intraoperatively (Table 5).

In the B-IV group all patients were in the state of satisfactory arousable sedation, and comparatively level of sedation was less than that in the IT group.

In the Control (C) group,the patients reached a maximum Ramsey score of 3 unlike the IT and IV groups in which the patients were more sedated.

Discussion

We demonstrate the comparative analgesic efficacy and safety profile of 0.5% 15mg Bupivacaine and intrathecal Dexmedetomidine (5µg) injected with 10 ml isotonic saline intravenously over 5 min in supine position immediately after patient has received intrathecal hyperbaric Bupivacaine 15 mg and Dexmedetomidine 5µg] and – 0.5% Bupivacaine & Dexmedetomidine (0.5µg/kg) as an adjuvant administered through intravenous route diluted in 10 ml isotonic saline over 5 min in the supine position immediately after patient has received intrathecal hyperbaric Bupivacaine. The groups (A-IT, B-IV, and C) were comparable with regard to age, gender, ASA grading and the preoperative haemodynamics.

The time of onset of sensory block was quickest in the A-IT group (2.6 ± 0.66 minutes) compared to the B-IV group (2.85 ± 0.95 minutes), followed by the control group (3.06 ± 1.02 minutes) however the difference was not statistically significant between the groups (p = 0.367 between A-IT and B-IV; p = 0.129 between A-IT and C; p = 0.619 between B-IV and C). This was in very much corroboration with the study (Ahmed M.S. et al., 2013) in which the onset of sensory block was 2.6 ± 0.66 minutes in the intrathecal (3µg) group, 2.8 ± 1.7 minutes in the intravenous (0.5 µg/kg) group, and 2.9 ± 1.3 minutes in the control group. [4]

Our findings were also in corroboration with the study conducted by Mahamoud M AL-Mustafa et al. (in 2009)[5] in which the researchers concluded that Dexmedetomidine has a dose dependent effect on the onset and regression of sensory and motor block when used as an adjuvant to Bupivacaine in spinal anesthesia.

In 2013, Harsoor SS et al[6][who assess the effects of IV Dexmedetomidine on sensory, motor, haemodynamic parameters and sedation during subarachnoid block (SAB)] concluded that administration of IV Dexmedetomidine during SAB hastens the onset of sensory block and prolongs the duration of sensory and motor block with satisfactory arousable sedation. Furthermore, our findings are in congruence with the study conducted by Aliye E et al.[7] in 2013 in which the investigators have concluded that intrathecal Dexmedetomidine addition to levo Bupivacaine for spinal anaesthesia shortens sensory and motor block onset time and prolongs block duration without any significant adverse effects.

The time to regression of sensory block by two dermatomes (TDSR) was 171 ± 15.61 minutes in the A-IT group, 144 ± 12.83 minutes in the B-IV group, and 96 ± 13.63 minutes in the C group. There was very statistically significant difference between the groups with regard to TDSR (p = 0.00004 between A and B groups, p ≤ 0.00001 between A and C groups, p ≤ 0.00001 between B and C groups). Our study findings were in corroboration with the findings of the study conducted by Ahmed M.S. et al.[4], 2013 in which TDSR was noted as 142 ± 41 minutes in the IT group, 105 ± 39 minutes in the IV group, and 70 ± 22 in the C group. Similar to our study, there was high statistically significant difference between group C and IV, C and IT (p < 0.001). Jung et al. (single dose Dexmedetomidine) also found that TDSR was significantly increased with IV Dexmedetomidine 0.25 – 0.5µg/kg

Similar to the onset of the sensory blockade, the onset of motor blockade was quickest in the A-IT group (8.15 ± 0.96), it was 8.5 ± 1.37 in the B-IV group, and 11 ± 1.85 in the C group. On intergroup analysis, there was no statistically significant difference between Group A-IT and B-IV (p = 0.365), however, it was very statistically significant between A and C Groups (p < 0.00001), and B and C groups (p = 0.00038).

Our study findings were in congruence with those noted by Ahmed M.S. et al. in 2013 in which the time to onset of motor blockade was 8.1 ± 3.1 minutes in the IT group, 8.5 ± 3.4 minutes in the IV group, and 11.1 ± 3.8 minutes in the Control group (p < 0.05; statistically significant difference between IT and C, and IV and C groups). Although the time to reach the Bromage 3 motor block was

significantly shorter in both IT and IV groups when compared with the Bupivacaine group, there was no statistically significant difference between the study groups (IT and IV).

Similar to the sensory block duration, in our study, the mean motor block duration was the highest in the A-IT group (419 ± 15.78), followed by the B-IV group (196 ± 14.74) and C group (184 ± 17.05). However, there was no statistically significant difference between the B-IV and C group (p=0.081) but, a very statistically significant was found to be present between A and B ($p < 0.00001$) and A and C ($p < 0.00001$). Similar results were noted in the Ahmed M.S. et al.[4] (2013) study. It was 251 ± 74 in the IT group, 210 ± 32 in the IV group, and 152 ± 41 in the Control group. The findings were statistically very significant between IT and C, and IV and C groups ($p < 0.001$). Difference in the duration of motor blockade in the similar groups in both the aforementioned studies may be dose related.

Al-Mustafa et al.[5] also observed prolongation of motor blockade while using a higher intravenous dose 1mcg/kg bolus followed by 0.5mcg/kg/h infusion of Dexmedetomidine. Conflicting the evidence, Lugo et al.[9] in their study noted prolongation of sensory block and duration of analgesia without significant effect on motor block while using 1 mcg/kg bolus followed by 0.5 mcg/kg/h infusion of Dexmedetomidine. In addition, Kaya et.al[3], reported that the use of a single dose of 0.5 mcg/kg of Dexmedetomidine did not affect the duration of motor block.

Kanaziet al.[10] study is in agreement with our study. They studied the effect of intrathecal low-dose Dexmedetomidine or clonidine on the characteristics of Bupivacaine spinal block. They found that Dexmedetomidine (3µg) or clonidine (30µg) when added to intrathecal Bupivacaine had a significantly shorter onset time of motor block and significantly longer sensory and motor regression times, with preserved hemodynamic stability and lack of sedation. Kalso et al.[11] as well showed that a small intrathecal dose of Dexmedetomidine (3µg), used in combination with Bupivacaine in spinal anesthesia, produced a shorter onset of motor block and a prolongation in the duration of sensory and motor block.

The efficacy of Dexmedetomidine was objectively visible on the analysis of requirement of rescue analgesia. The mean time to 1st rescue analgesia was 361.7 ± 39.89 minutes in the A-IT, 216 ± 27 minutes in the B-IV group, and 122.75 ± 15.85 minutes in the control group. The intergroup analysis showed that there is statistically very significant difference between A and B groups ($p < 0.00001$), A and C groups ($p < 0.00001$), and B and C groups ($p < 0.00001$). In congruence with our study, in another study[4] (Ahmed M.S. et al. 2013), the time to first analgesic needed was significantly prolonged in groups IV and IT in comparison with group B, without significant difference between groups IV and IT. In the same study, the mean total consumption of the analgesic postoperatively in the first 24 h was significantly decreased in groups IV and IT in comparison with group B, without significant difference between groups IV and IT.

This is in corroboration with the study conducted by Saadawy and coworkers[12] who added Dexmedetomidine (1µg/kg) to Bupivacaine for caudal anesthesia in pediatrics and achieved longer analgesia, less rescue analgesic consumption, and improved sleep quality with no adverse clinically relevant side effects.

Similarly, El-Hennawy and colleagues[13] found that both Dexmedetomidine and clonidine medications mixed with Bupivacaine significantly prolonged analgesia when compared with using Bupivacaine alone 16 h (15–19 h) for Dexmedetomidine, 12 h (3–21 h) for clonidine, and 5 h (4–6 h) with plain Bupivacaine; $p < 0.001$). However, the study showed no difference with analgesia duration ($p = 0.796$) between either Dexmedetomidine or clonidine when added to Bupivacaine.

Some recent investigations have studied the effects of mixing Dexmedetomidine with local anesthetics during peripheral nerve and nerve plexus blockade. A study by Obayah and colleagues[14] added Dexmedetomidine to Bupivacaine during placement of a greater palatine nerve block for cleft palate repair. The addition of Dexmedetomidine to Bupivacaine provided lower pain scores and prolonged analgesia (approximately 50%) with no negative effect on hemodynamics when compared with Bupivacaine alone.

Jung et al.[8] also noticed significant increase in sensory and motor anesthesia. In another study, the investigators reported that sensory block was prolonged by at least 34%, motor block duration was prolonged by at least 17%, and time to first analgesic request was increased by at least 53%. The results of Mohamed et al.[5] study were concomitant with the present study. The investigators of the study concluded that Dexmedetomidine 5µg given intrathecally improved the quality and the duration of postoperative analgesia and also provided an analgesic-sparing effect.

Reduction in Heart Rate was significant with intravenous Dexmedetomidine at 20, 45, and 60 minutes in another study.[5] Transient reversible bradycardia was increased in the Dexmedetomidine group, but there was no difference in the incidence of hypotension or post-operative sedation. In the study conducted by Harsoor SS[6] intraoperative heart rate was significantly decreased with intravenous Dexmedetomidine from 30 to 60 min.

There was a statistically significant difference evident between the study groups (A-IT and B-IV) at 5 instances (3, 5, 10, 20, and 120 minutes) [p = 0.012; 0.006; 0.0007, 0.029, 0.049 respectively] with regard to MBP. This statistically significant difference was present between B-IV and C group from 5 through 120 minutes. On comparing B and C groups, significant difference was present at 45 and 60 minutes (p = 0.043; 0.012).

In another study[6], MAP was significantly low from 60 min until end of surgery and for the initial 2 h postoperatively, and this may be because of the continuous Dexmedetomidine infusion 0.5μg/kg/h. In the intergroup analysis of Respiratory Rate, we found 2 instances of statistically significant difference between A and B groups (p = 0.04; 0.034), two instances of difference between B-IV and C groups (p = 0.031; 0.0001), at one instance between A-IT and C groups (p = 0.049). However, in none of the instances it was clinically significant.

JyotsnaKubre et al.[17] (2016) observed lesser incidence of bradycardia and hypotension intraoperatively as well as postoperatively with IV Dexmedetomidine as an adjuvant with Bupivacaine. We did not find any statistically and/or clinically significant differences within and/or between the groups with regard to SpO_2, intraoperative or postoperative nausea or vomiting in any of the three groups of patients. We also did not notice any evidence of clinical criteria suggesting local anesthetic toxicity (lightheadedness, dizziness, tinnitus, disorientation, drowsiness, generalized muscle twitching, convulsions, respiratory depression, cardiovascular depression, and collapse) in addition to possible systemic effects of Dexmedetomidine.

In our study, the intrathecal group were more sedated (all the patients in Ramsey score 3 or 4 from 45 minutes through 90 minutes intraoperatively) while the patients in the IV group reached a lesser level of sedation comparatively. In the control group, patients mostly reached Ramsey level 2 score only – indicating that intrathecal route of administration of Dexmedetomidine induced more and quicker sedation when compared to the IV and the control groups. In conclusion, in our study, Dexmedetomidine produced satisfactory arousable sedation without causing respiratory distress.

Our findings were in corroboration with JyotsnaKubre et al.[17] (2016) concluded that IV Dexmedetomidine produces satisfactory arousable sedation without causing respiratory depression. In agreement with the aforementioned studies, in 2013, Harsoor SS et al.[6] [who assessed the effects of IV Dexmedetomidine on sensory, motor, haemodynamic parameters and sedation during subarachnoid block (SAB)] concluded that administration of IV Dexmedetomidine during SAB hastens the onset of sensory block and prolongs the duration of sensory and motor block with satisfactory arousable sedation.

Conclusion

Dexmedetomidine when administered in higher doses intrathecally (5 micrograms in our study, compared to 0.5 micrograms to 3 micrograms used in other previous studies) is more effective with no unpredictable adverse effects. We found various combinations and permutations of statistically very significant, statistically significant, statistically insignificant, and clinically significant results with regard to various parameters we have studied in general, but, very specifically, we have found statistically and clinically significant results with regard to the onset of sensory and motor blockade, duration of analgesia, and the requirement of rescue analgesics. We found that dexmedetomidine is hemodynamically stable and produces no significant undesirable side effects.

Finally, we conclude that, adding dexmedetomidine intravenously (0.5 μg/kg) or intrathecally 5μg to bupivacaine, as an adjuvant provides Significant enhancement of onset of sensory and motor blockade, Increases the duration of sensory and motor blockade, Prolonged duration of analgesia, Reduces the use of supplemental opioidrequirements and causes satisfactory and arousable sedation. Improved parameters of analgesic efficacy support the use of dexmedetomidine as an adjunct intrathecally with local anaesthetics (bupivacaine in specific) to improve pain management and prolong anesthesia duration of local anaesthetics

References

1. Davies NJH, Cashman JN. Techniques in regional anaesthesia. Lee's Synopsis of Anaesthesia. 13th ed. Elsevier, 2006.pp.401-70.

2. Strebel S, Gurzeler J, Schneider M, et al. Small doseintrathecal clonidine and isobaric bupivacaine for orthopedic surgery: adoseresponse-study. AnesthAnalg 2004;99:1231–1238.
3. Kaya FN, Yavascaoglu B, Turker G, et al. Intravenousdexmedetomidine,but not midazolam, prolongs bupivacaine spinal anesthesia. Can J Anaesth 2010;57:39–45
4. Ahmed M.S. Hamed, Sahar M. Talaat. Effect of intravenous versus intrathecal low- dose dexmedetomidine on spinal block in lower limb orthopaedic surgery. Ain- Shams J Anesthesiol 07:205–210
5. Mahmoud M. Al-Mustafa, Sami A. Abu-Halaweh, AbdelKarim S. Aloweidi, et al. Effect of dexmedetomidine added to spinal bupivacaine for urological procedures. Saudi Med J 2009;30(3):365-370.
6. Harsoor SS, Rani DD, Yalamuru B, Sudheesh K, Nethra SS. Effect of supplementation of low dose intravenous dexmedetomidine on characteristics of spinal anaesthesia with hyperbaric bupivacaine. Indian J Anaesth 2013;57:265–269.
7. Esmaoglu A, Turk S, Bayram A, et al. The Effects of Dexmedetomidine Added to Spinal Levobupivacaine for Transurethral Endoscopic Surgery. Balkan Med J 2013;30:186-90.
8. Jung SH, Lee SK, Lim KJ, et al. The effects of single-dose intravenous dexmedetomidine on hyperbaric bupivacaine spinal anesthesia. J Anesth 2013; 27:380–384.
9. Lugo VW, Gomez IA, Cisneros-Corral R, et al. Intravenous dexmedetomidine versus intravenous clonidine to prolong bupivacaine spinal anaesthesia. A double blind study. Anestesia en Mexico 2007;19: 143–146.
10. Kanazi GE, Aouad MT, Jabbour-Khoury SI, et al. Effect of low-dose dexmedetomidine or clonidine on the characteristics of bupivacaine spinal block. Acta Anaesthesiol Scand 2006;50:222-7.
11. Kalso EA, Poyhia R, Rosenberg PH. Spinal antinociception by dexmedetomidine, a highly selective α2-adrenergic agonist. Pharmacol Toxicol 1991;68:140–143.
12. Saadawy I, Boker A, Elshahawy MA, et al. Effect of dexmedetomidine on the characteristics of bupivacaine in a caudal block in pediatrics. Acta Anaesthesiol Scand 2009;53:251-6.
13. El-Hennawy AM, Abd-Elwahab AM, Abd-Elmaksoud A M, et al. Addition of clonidine or dexmedetomidine to bupivacaine prolongs caudal analgesia in children. Br J Anaesth 2009;103:268-74.
14. Obayah GM, Refaie A, Aboushanab O, et al. Addition of dexmedetomidine to bupivacaine for greater palatine nerve block prolongs postoperative analgesia after cleft palate repair. Eur J Anaesthesiol 2010;27:280-4.
15. Gupta R, Verma R, Bogra R, et al. A comparativestudy of Intrathecaldexmedetomidine and fentanyl as adjuvants to bupivacaine. J AnaesthClinPharmacol. 2011;27:339-43.
16. Mohamed AA, Fares KM, Mohamed SA. Efficacy of intrathecally administered dexmedetomidine versus dexmedetomidine with fentanyl in patient undergoing major abdominal cancer surgery. Pain Physician 2012;15:339–348.
17. Kubre J, Sethi A, Mahobia M, et al. Single dose intravenous dexmedetomidine prolongs spinal anesthesia with hyperbaric bupivacaine. Anesth Essays Res 2016;10:273-7.