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Original Article

Anaesthesia Section

Effect of Different Doses of Dexmedetomidine as Adjuvant in Bupivacaine -Induced Subarachnoid Block for Traumatized Lower Limb Orthopaedic Surgery: A Prospective, Double-Blinded and Randomized Controlled Study

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ABSTRACT

Background and Aims: Improved pain management for blunt trauma to the lower extremity has shown to reduce morbidity, induce early ambulation and improve long-term outcomes. Dexmedetomidine; a selective α-2 agonist; has recently been used intrathecally in different doses to prolong spinal anaesthesia. We evaluated the effect of adding two different doses of dexmedetomidine to hyperbaric bupivacaine for spinal anaesthesia. The primary endpoints were the onset and duration of sensory, motor block and duration of analgesia.

Materials and Methods: Eighty patients, (20-60yrs) posted for elective lower limb orthopedic surgery of traumatic origin under spinal anaesthesia were divided into 2 equal groups (Group D_5&D_{10}) in a randomized, double-blind fashion. In this prospective parallel group study, group D_5(n=40) 3ml 0.5% hyperbaric bupivacaine+5μg dexmedetomidine in 0.5 ml of normal saline and group D_{10} (n=40) 3ml 0.5% bupivacaine+10μg dexmedetomidine in 0.5 ml of normal saline were administered intrathecally. Sensory and motor block onset times and block durations, time to first analgesic use, total analgesic need, postoperative VAS, hemodynamics and side effects were recorded for each patient.

Results: Though with similar demographic profile in both groups, sensory and motor block in group D_{10}($p<0.05$) was earlier than group D_5. Sensory, motor block duration and time to first analgesic use were significantly longer and the need for rescue analgesics was lower in group D_{10}($p<0.05$) than D_5. 24 h VAS score was significantly lower in group D_{10}($p<0.05$). Intergroup hemodynamics was comparable ($p>0.05$) without any appreciable side effects.

Conclusion: Spinal dexmedetomidine increases the sensory, motor block duration and time to first analgesic use, and decreases analgesic consumption in a dose-dependent manner

Keywords: Dexmedetomidine, Hyperbaric bupivacaine, Spinal anaesthesia (intrathecal, subarachnoid)

INTRODUCTION

Trauma is a major cause of mortality throughout the world. In addition to the cost in lives, productivity, and money, trauma exacts a steep toll on patients in the form of physical suffering and mental anguish. In recent years, major advances have been made in the management of trauma, the end result of which has reduced mortality and enhanced function. One of these areas is pain control. Improved pain management for blunt trauma to the lower extremity has not only led to increased comfort in trauma patients, but has also been shown to reduce morbidity, early ambulation and improve long-term outcomes.

Effective management of perioperative and postoperative pain after lower extremity orthopedic surgery represents an important component of early postoperative recovery as it serves to blunt autonomic, somatic and endocrine reflexes with a resultant potential of decreasing perioperative morbidity [1]. Thus, adequate pain management is essential to facilitate rehabilitation and accelerate functional recovery, enabling patients to return to their normal activity more quickly. Polypharmacological approach is the most common practice to treat perioperative pain, as no single agent has yet been identified to specifically inhibit nociception without associated side effects [2]. Different techniques and drugs had been studied in order to prolong the duration of regional anesthesia and achieve postoperative pain relief [3]. Opioids are commonly added to local anaesthetics to produce spinal and epidural anesthesia. However, significant adverse effects such as, urinary retention, respiratory depression, hemodynamic instability, pruritus and occasionally severe nausea and vomiting, may limit their use [4-6].

Diverse classes of drugs such as opioids [7], epinephrine [8], neostigmine [9], magnesium [10], midazolam [11], ketamine [12], and clonidine [13] have been added to intrathecal local anaesthetics in an attempt to prolong analgesia and reduce the incidence of adverse events.

Dexmedetomidine is a highly selective α_2 adrenoceptor agonist with sedative and analgesic properties and has been approved by Food and Drug Administration (FDA) as a short-term sedative for mechanically ventilated intensive care unit (ICU) patients. IV dexmedetomidine has been found to reduce the anaesthetic requirements during the general anaesthesia [14]. It has been found to exert its analgesic actions both at the spinal and supraspinal levels [15].

Dexmedetomidine is still under evaluation as an ideal neuraxial adjuvant as it provides stable hemodynamic conditions, good quality of intraoperative and prolonged postoperative analgesia

Parameter	Group-D_5 (n=40)	Group-D_{10} (n=40)	p value
Age (years)	54.9±5.4	56.3±5.1	0.350
Bodyweight (Kg)	57.10±8.48	58.15±11.25	0.642
Sex(Male/ Female)	33(82.5%):7(17.5%)	32(80%):8(20%)	0.775
ASA physical status (I/II)	28/12	30/10	0.617
Height (cm)	154.9±6.7	156.7±9.1	0.396
Duration of Surgery (min)	109±21	111±18	0.260

[Table/Fig-1]: Comparison of demographic data between the two study groups

Surgical Procedures	Group-D^5 (n=40)	Group-D_{10} (n=40)
Intramedullary Nailing of Femoral Shaft fracture	8(20)	9(22.5)
Bipolar hemiarthroplasty for femoral neck fracture	6 (15)	8(20)
Interlocking tibia nails for fracture tibia	8(20)	6(15)
Bimalleolar fracture	3(7.5)	4(10)
Tension band wiring for patella fracture	3(7.5)	1(2.5)
Open reduction internal fixation in femoral intercondylar fracture	1(2.5)	1(2.5)
External fixation of tibia for severe open fracture	7(17.5)	8(20)
Arthroscopic repair for anterior cruciate ligament repair	4(10)	3(7.5)

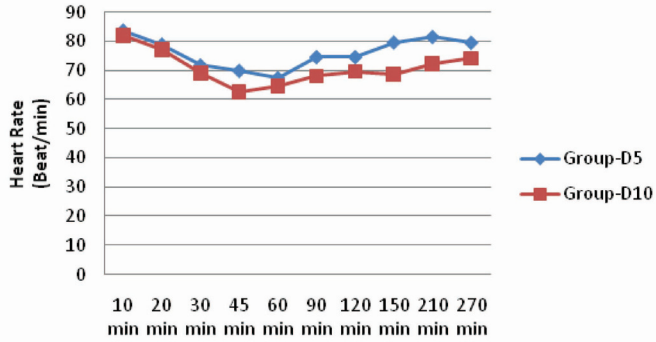
[Table/Fig-2]: Detailed surgical procedures for randomized patient groups, *Data are n (%)*

Preoperative parameters	Group-D_5 (n=40)	Group-D_{10} (n=40)	p value
Haemoglobin (gm/dl)	10.8±1.3	10.1±1.4	0.20
Systolic BP (mm Hg)	122.75±13.58	128.25±15.71	0.98
Diastolic BP (mm Hg)	80.45±6.57	81.95±9.66	0.42
Mean Arterial Pressure	94.54±8.17	97.38±10.67	0.18
Pulse Rate (bpm)	78.4±10.10	76.0±15.36	0.38

[Table/Fig-3]: Comparison of preoperative vitals between the Study groups

Parameters	Group-D_5 (n=40)	Group-D_{10} (n=40)	p value
Sensory block level (median)	T8 (T6--T10)	T8 (T4—T10)	0.055
Time taken to achieve Sensory Blockade T10 (min)	2.56±1.15	2.10±1.11	0.044
Time for Sensory Regression to T10 (min)	130.12± 20.70	160.63± 17.76	0.001
Time for Sensory Regression to S2 (min)	189.10±30.50	216.50±27.07	0.010
Time for maximum motor block of Modified Bromage scale 3 (min)	7.30± 1.99	6.78± 1.01	0.037
Time for Motor recovery to Modified Bromage scale 0 (min)	128±14.6	164.08±12.50	0.001
Duration of Analgesia (min)	227.00±19.85	241.80±42.10	0.027
No of analgesic doses	1.76±0.87	1.04±1.01	0.010

[Table/Fig-4]: Characteristics of sensory and motor blocks between the Study groups



[Table/Fig-5]: Comparison of heart rate (beats/min) between two groups

with minimal side effects [16-18]. Kanazi et al., demonstrated a significant prolongation in the duration of sensory and motor block with dexmedetomidine used as intrathecal additive for 0.5% heavy bupivacaine [16].

Previous few other studies have described the intrathecal use of dexmedetomidine in a wide range (2-10 µg) [17-20].

Considering all these observations we aimed to conduct a study to evaluate and compare the effect of 5µg and 10µg of dexmedetomidine added to 15 mg (3 ml) 0.5% hyperbaric bupivacaine intrathecally, for planned orthopaedic operations of traumatized lower limb, with respect to duration of sensory and motor block, adequacy of analgesia, and associated side effects if any.

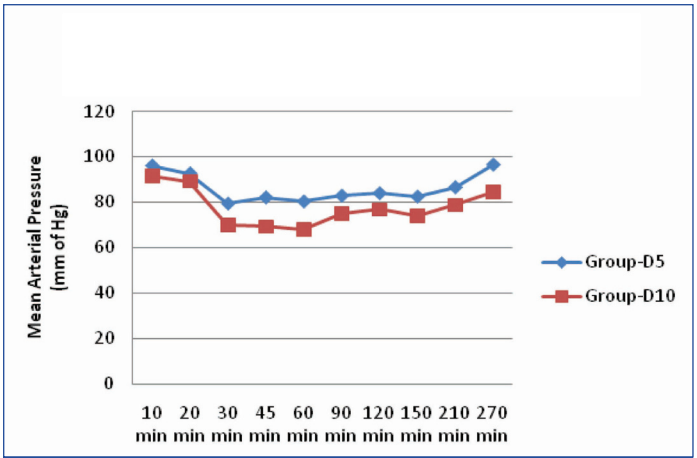
MATERIALS AND METHODS

Our study was a randomized, patient–and observer-blind (double blinded), concentration-controlled, single centre trial with parallel groups. After obtaining permission from institutional ethics committee, written informed consent was taken. From 2008 June to 2009 December, total 80 adult patients were randomly allocated to two equal groups (n=40 in each group) using computer generated random number list. Patients having ASA physical status I & II, age 20-60 y and of both sexes undergoing elective lower limb orthopedic surgery; resulted from various trauma; (like intramedullary nailing of femoral and tibial shaft fracture, bipolar hemiarthroplasty for femoral neck fracture, bimalleolar fracture, tension band wiring for patella fracture, external fixation of tibia for severe open fracture etc.) under spinal anaesthesia were included in this study. Selected patients (N=80) were randomly allocated in two groups (40 patients in each groups). Patients in Group-D_5 and Group-D_{10} received dexmedetomidine 5 and 10 µg respectively along with 3ml (15 mg) of 0.5 % hyperbaric bupivacaine in subarachnoid space for spinal anaesthesia for the patients undergoing elective lower limb orthopedic surgery. We have only selected the patients who had a history of lower limb traumatic injury.

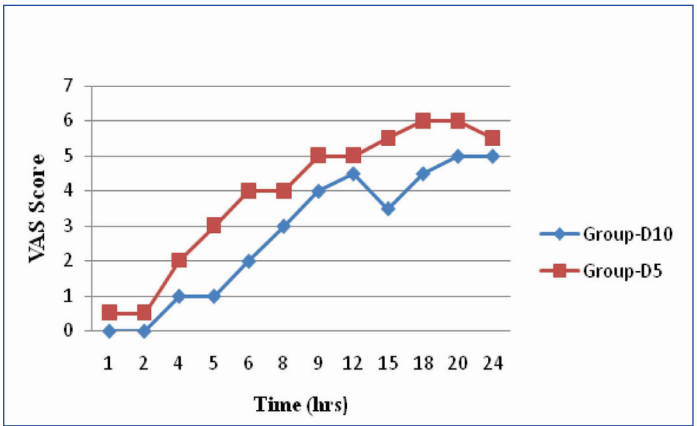
Exclusion criteria- Patient refusal, any known allergy or contraindication to bupivacaine or dexmedetomidine, pregnancy, lactating mothers, hepatic, renal or cardiopulmonary abnormality, alcoholism, diabetes, long term analgesic or anticoagulant therapy, spinal cord deformities, bleeding diathesis, local skin site infections were excluded from the study.

In preoperative assessment the patients were enquired about any history of drug allergy, previous operations or prolonged drug treatment. General examination, systemic examinations and assessment of the airway were done. Preoperative fasting of minimum 6 hours was ensured before operation in cases. All patients received premedication of tablet diazepam 10 mg orally the night before surgery as per preanesthetic check up direction to allay anxiety, apprehension and for sound sleep. The patients also received tablet ranitidine 150 mg in the previous night and in the morning of operation with sips of water.

All patients were clinically examined in the preoperative period, when whole procedure was explained. 10 cm visual analogue scale (VAS) (0, no pain and 10, worst pain imaginable) was also explained during preoperative visit. All patients are investigated for Hb%, TLC, DLC, ESR, platelet count, blood sugar, blood urea and creatinine and liver function tests. A 12 lead ECG and chest X-ray were also taken. On entering the patient in the operative room standard intraoperative monitors like ECG, pulse oximeter, non invasive blood pressure were attached and baseline parameter were recorded. The patients were preloaded with Lactated Ringer's solution 10 ml/kg. Philips Intelleview MP20 monitor used for this purpose.



[Table/Fig-6]: Comparison of Mean Arterial Pressure (mm of Hg) between two groups.



[Table/Fig-7]: Comparison of VAS score between two groups

Determination of whether a patient would be given spinal anaesthesia adjuvant Dexmedetomidine 5 µgm or 10 µgm was made by reference to a statistical series based on random sampling numbers generated by computers for each orthopaedics procedure at the anaesthesia department; the details of the series were unknown to any of the investigators or to the expert resident who administered spinal anaesthesia and were contained in a set of sealed spinal tray, each bearing on the outside only the name of the operation theatre and procedure details and a number. This sealed tray was prepared by resident (R1) as per group allocation from computer. The under surface of the tray was affixed with the name of the group D_5 or D_{10}. This was not allowed to be noticed by expert resident (R2) or investigator.

The anaesthetic technique was standardized for all patients. In our tertiary care hospital in the Orthopaedics operation theatre with aseptic precautions Lumber puncture was done in sitting position at L3 and L4 inter-vertebral space in median approach with 26 Gauge spinal (Quincke) needle. Patients were randomly divided into the following groups: Group D_5 to receive 3 ml volume of 0.5% hyperbaric bupivacaine and 5 µg dexmedetomidine in 0.5 ml of normal saline intrathecally (dexmedetomidine (100 µg/ml) was diluted in preservative-free normal saline) and Group D_{10} to receive 3 ml volume of 0.5% hyperbaric bupivacaine with 10 µg dexmedetomidine in 0.5 ml of normal saline intrathecally with similar dilution technique. Intrathecal injection was given over approximately 10 sec. Patients were made to lie supine immediately after completion of the injection.

Oxygen (2 L/min) was administered via a mask if the pulse oximeter reading decreased below 90%. Any decrease in SBP < 100 mmHg or a drop > 20% of baseline value was considered as hypotension and SBP< 90 mm Hg was treated with 6 mg slow i.v.

Parameters	Group D^5 (n=40)	Group D^{10} (n=40)	P value
Nausea	2	7	0.19
Vomiting	1	4	0.16
Shivering	5	7	0.69
Bradycardia(HR<60 bpm)	2	5	0.12
Bradycardia (HR<60 bpm, Atropine required)	0	4	0.04
Hypotension(SBP< 100mm Hg)	6	12	0.12
Hypotension(SBP< 90mm Hg, mephenteramine required)	3	5	0.46

[Table/Fig-8]: Comparison of side effects

mephenteramine which may be repeated after 5 min if SBP not corrected. Tachycardia was defined as HR>100 and bradycardia when HR<60. When HR falls <50 beats/min inj atropine 0.5mg i.v. was administered. The incidence of adverse effects, such as nausea, vomiting, shivering, pruritus, respiratory depression, sedation, bradycardia and hypotension were recorded. Sensory testing was assessed by loss of pinprick sensation to 23G hypodermic needle and dermatomes levels were tested every 2 min until the highest level had stabilized by consecutive tests. Degree of motor blockade was tested by James Modified Bromage score [0 = no weakness, able to raise leg straight against resistance, 1 = unable to raise leg straight but able to flex knee, 2 = unable to flex knee but with free movement of feet, 3 = unable to move leg or feet].

On achieving T_8 sensory blockade level, surgery was allowed. Testing was then conducted every 10 min until the point of two segment regression of the block was observed. Further testing was performed at 20-min intervals until the recovery of S2 dermatome. The surgeon, patient, and the observing anaesthesiologist were blinded to the patient group. Data regarding the highest dermatome level of sensory blockade, the time to reach this level from the time of injection, time to S1 level sensory regression, time to urination, and incidence of side effects were recorded.

Postoperatively, the pain score was recorded by using visual analogue pain scale (VAS) between 0 and 10, initially every 1 h for 6 h, then every 2 h for the next 8 h and then after every 4 h till 24 h. Diclofenac sodium (75 mg) was given intramuscularly as rescue analgesia when VAS score was >4.

Our primary outcome was to compare the duration of sensory and motor block. Secondary outcome was to observe the onset of sensory and motor block, height of sensory block achieved, duration of sensory and motor block, Time and dosage of analgesic used, to compare the pain score between two groups and any side effect noted throughout the study period.

STATISTICAL ANALYSIS

Sample size was estimated using average two segment regression time in minutes for sensory blockade among two groups as the main primary variable. The average sensory regression time in each group was 120 min and to detect a difference of 10% (i.e. 12 min), at the p<0.05 level, with a probability of detecting a difference this large, if it exists, of 80% (1–beta=0.80).On the basis of previous study assuming within group SD of 18 min and we needed to study at least 36 patients per group to be able to reject the null hypothesis that the population means of the groups are equal with probability (power) 0.80. Randomization was conducted using a computer random number generator in the Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, USA), version 18.0. Raw data were entered into a MS Excel spreadsheet and analyzed using same software. Categorical variables were analyzed using the Pearson's chi square test. Normally distributed continuous variables were analyzed using the independent sample t-test. For within group comparison: The test of statistical significance applied was-

repeated Measures ANOVA followed by Tukey's test. p-value < 0.05 was considered statistically significant.

RESULTS AND ANALYSIS

We recruited 40 subjects per group, more than the calculated sample size. There were no dropouts or failed spinal cases. The age, body weight, sex distribution, ASA status, height and duration of surgery in the two groups were found to be comparable [Table/Fig-1]. Various types of lower limb orthopedic operations due to various traumas were also similar in two groups and had no statistical significance [Table/Fig-2]. [Table/Fig-3] shows preoperative heart rate; systolic, diastolic, mean blood pressure; and haemoglobin levels between two groups which were quite comparable. Onset of both sensory and motor block were earlier in D_{10} group than group D_5 [Table/Fig-4] and they were statistically significant (p<0.05). From [Table/Fig-4] it is seen that sensory and motor block durations are also significantly greater in the group D_{10} (p<0.05) than D_5 group.

The mean time from subarachnoid block to first request for pain medication i.e. the duration of analgesia was 241.80 min in the (10µg) dexmedetomidine group but 227.0 m in the (5µg) dexmedetomidine group. This difference was also statistically significant (p<0.05) [Table/Fig.-4].

[Table/Fig-4] shows that group D_{10} required less number of diclofenac sodium injection (1.04 vs 1.76 times) as rescue analgesics than patients in group D_5 in first 24 h of postoperative period, and the difference is also statistically significant (p-value < 0.05).

[Table/Fig-5&6] shows heart rate and mean arterial pressure among two groups respectively. [Table/Fig-7] shows that VAS score was of higher value in group D_5 than D_{10} group. Again group D_{10} suffered more from bradycardia than group D_5 which was statistically significant (p<0.05). Other side effects were quiet comparable (p>0.05) among two groups [Table/Fig-8].

DISCUSSION

Injury is the leading cause of death for people aged 1–44 in the U.S. and an estimated 31.6 million people are being treated in emergency department for injury each year [21]. Injury mortality ranges from 0.5 (high-income countries) to 1.5 (European Region) per 1000 adults aged 15–59 y. The proportion of deaths in this age group due to injuries ranges from 22% (high-income countries) to 29% (the Americas) of all deaths at ages 15–59, except in Africa, where it is 13% [22].

Long bone fractures during trauma can result in significant pain, especially prior to stabilization, due to the significant number of nerve endings located in the periosteum and mineralized bone [23]. Regional anaesthesia for lower extremity fractures, including femur and hip fractures, has been extensively studied in the literature. Meta-analyses suggest that regional anaesthesia, specifically central neuraxial anesthesia, decreases the incidence of deep venous thrombosis (DVT) and pulmonary embolism as well as the incidence of postoperative confusion, in addition to reducing the risk of postoperative pneumonia in patients who require surgical stabilization [24,25].

Regional anaesthesia for major lower limb has long been provided by central neuraxial blockade. Local anaesthetics alone for subarachnoid block provide good operative conditions but have shorter duration of postoperative analgesia. So various drugs like opioids [7], epinephrine [8], neostigmine [9], magnesium [10], midazolam [11], ketamine [12], and clonidine [13] have been used as adjuvant to intrathecal local anaesthetics to achieve quick, dense and prolonged block, but the results were associated with side effects.

Dexmedetomidine; a highly selective, α_2-adrenergic agonist; has analgesic, sedative, anaesthetic sparing effects when used in systemic route [26]. Use of dexmedetomidine as an adjuvant mixed with local anaesthetics has been performed with neuraxial anesthesia in both adult and paediatric patients [17,27].

In this prospective, randomized, double-blinded trial on traumatized lower limb orthopaedic operations we had compared the effect of 5µg and 10µg of dexmedetomidine added to 15 mg (3 ml) 0.5% hyperbaric bupivacaine intrathecally, on the onset time and duration of sensory and motor block as well as on the postoperative rescue analgesic (injection diclofenac sodium) requirement and associated side effects if any.

The demographic profile, between two groups, which was statistically insignificant (p > 0.05) of our patients was quite similar with other research investigations and provided us the uniform platform to evenly compare the results obtained. A study on the role of dexmedetomidine for postoperative analgesia was conducted by Gupta et al., in a total of 100 patients yielded similar results [19]. The mean duration of surgery was almost comparable in both the groups with no significant statistical difference [Table/Fig-1]. From [Table/Fig-2] it is quite evident that different lower limb orthopedic operations having traumatic history were almost similar in both the groups and had no statistical significance. From [Table/Fig-3] it is found that preoperative haemoglobin and hemodynamic variables (heart rate, systolic and diastolic blood pressure, mean arterial pressure) were comparable in both the groups.

The median height of sensory blockade though similar in both the groups, group D_{10} shows slightly higher block levels in few patients but the comparison is clinically and statistically insignificant (p>0.05). Similarly Gupta et al., found that addition of 5 µg dexmedetomidine to intrathecal ropivacaine produced one segment higher sensory block than placebo group though the results were clinically insignificant [19].

Median time taken to achieve T10 level sensory block was earlier in group-D_{10} than group-D_5 (2.10 and 2.56 min respectively). Similarly time for maximum motor block of Modified Bromage scale three was earlier in group-D_{10} than group-D_5 (6.78 and 7.30 min respectively). So both the sensory and motor block onset was significantly earlier in group-D_{10} than group-D_5 (p <0.05). Our results were quite similar to that of Esmaoglu et al., [28], who found onset of sensory and motor block were earlier in dexmedetomidine group in a statistically significant manner. Again Al-Mustafa et al., [18] also found that dexmedetomidine produced earlier onset of sensory and motor block in a dose dependent manner for the patients with urological operations. In our study, Sensory regression time to T10 and S2 were significantly (p<0.05) delayed in D_{10} group when compared with D_5 group (160.63 vs. 130.12 and 216.50 vs. 189.10 min respectively) which means increased dexmedetomidine at subarachnoid space had produced more sustained sensory block. Again motor block regression to modified Bromage 0 were also significantly (p<0.05) prolonged in group D_{10} than D_5 (164.08 vs 128 min respectively). Gupta et al., [19] found that sensory block regression was significantly slower with the addition of intrathecal dexmedetomidine as compared to ropivacaine alone, as both time to two segment regressions and time to S2 regression were significantly delayed with intrathecal dexmedetomidine. Esmaoglu et al., [28] also found that addition of dexmedetomidine to levobupivacaine caused a significant delay in sensory as well as motor block regression for the patients undergoing transurethral endoscopic surgery. Eid HEA et al., [29] in their study concluded that 15µg intrathecal dexmedetomidine along with bupivacaine significantly prolonged the time to two segment regression, sensory regression to S1 and regression of motor block to modified Bromage 0 in a dose dependent manner while compared with 10µg dexmedetomidine and saline control group [29].

In our study, mean duration of analgesia in the D_{10} and D_5 group were 4.03 h (241.80 min) and 3.78 h (227.00 min) respectively [Table/Fig-4] which was statistically significant ($p<0.05$). Gupta et al., [19] found that the duration of analgesia was significantly prolonged with the addition of intrathecal dexmedetomidine as compared to ropivacaine alone intrathecally (478.4±20.9 min and 241.67±21.67 min, respectively). Again Eid HEA et al., [29] also found that addition of dexmedetomidine intrathecally caused prolongation of first rescue analgesic requirement significantly and this prolongation occur in a dose dependent manner. A meta-analysis of use of dexmedetomidine in regional anaesthesia states that the sensory duration, motor blockade and request for rescue analgesia is prolonged in dexmedetomidine group [30].

In our study, we have found that the analgesic effect of intrathecal bupivacaine was potentiated in a dose dependent manner by intrathecal adjuvant dexmedetomidine. Patients of D_{10} group required significantly less number of diclofenac sodium injection (1.04 vs 1.76 times) in first 24 h of postoperative period than the patients of D_5 group (p-value < 0.01). Gupta et al., [19] noticed less diclofenac sodium consumption in intrathecally dexmedetomidine, ropivacaine treated group than plain ropivacaine (0.97 vs 2.7) group. Similar results were also observed by Eid HEA et al., [29] where diclofenac consumption was reduced in a dose dependent manner after intrathecal dexmedetomidine administration.

Bradycardia was observed in both group D_{10} and D_5 (5 vs 2 patients respectively) of which 4 patients in D10 group required atropine (0.6mg i.v) injection where as no patients in D5 group required active management. This side effect was found to be statistically as well as clinically significant ($p<0.05$). Other side effects- including hypotension, nausea, vomiting, shivering though noted in both the groups but the difference was not statistically insignificant ($p>0.05$). Gupta et al., [19] and Esmaoglu et al., [28] also observed similar side effects without any significant difference among two groups. Occurrence of hypotension and bradycardia in our study is possibly due to higher dose of dexmedetomidine in D_{10} group.

In this study we should compare sedation score as both the drugs have sedation property, BIS value should be measured, Duration of study should be prolonged to assess long term effects. Again, we should measure the Cortisol or other stress hormones as all the cases have been originated from trauma and pre-existing stress hormone levels should be high.

Although the mechanism is unclear, intrathecal α_2 adrenoceptor agonists like dexmedetomidine prolongs the motor and sensory block duration of local anaesthetics. Dexmedetomidine acts by binding to pre-synaptic C-fibres and post-synaptic dorsal horn neurons. The analgesic action of intrathecal α_2 -adrenoceptor agonists is by depressing the release of C-fibre transmitters and by hyperpolarisation of post-synaptic dorsal horn neurons [31]. The antinociceptive effect may explain the prolongation of the sensory block when added to spinal anaesthetics. The prolongation of the motor block of spinal anaesthetics may result from the binding of α_2 -adrenoceptor agonists to motor neurons in the dorsal horn [32].

CONCLUSION

Finally we do conclude that addition of 10 µg in comparison to 5 µg dexmedetomidine to hyperbaric bupivacaine 0.5% more efficiently hastens the onset and prolongs the duration of sensory and motor blockade and reduces the requirement of rescue analgesic in postoperative period for the patients undergoing traumatized lower limb orthopedic surgery.

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