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To Compare Effects Of Buprenorphine And Dexmedetomidine As Adjuvant To Bupivacaine Spinal Anaesthesia In Elderly Patients Undergoing Lower Abdominal Surgeries: A Randomized Controlled Study.

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Abtract:Background and Aims: *The objective is to compare the efficacy of addition of buprenorphine or dexmedetomidine to bupivacaine in sensory and motor blockade duration, two segment regression and time of first analgesic requirement. Use of low-dose spinal anaesthesia is advantageous in elderly as it reduces the hemodynamic and heart rate variability.* ***Methods:*** *sixty patients are randomly allocated into three groups Group A: received 15 mg of 0.5% hyperbaric bupivacaine along with 0.2 ml Normal saline; Group B: received 15 mg of 0.5% hyperbaric bupivacaine along with 60 mcg of buprenorphine; Group C: received 15 mg of 0.5% hyperbaric bupivacaine along with 5 mcg of dexmedetomidine. Data between the 3 groups were compared and analysed using ANOVA test and chi square test.* ***Results****: All 60patients completed the study. Postoperative analgesia was not required in the first 24 h in a total of 8 (40%), 12 (60%) and 15 (75%) patients in groups A, B, and D, respectively. Time to S1 regression was 129+/-44 min (Group A), 146+/-53.6 min (Group B) and 172+/-58.7 min (Group C), P = 0.0417 .Time to complete motor recovery was 177+/-56.9 min (Group A), 226+/-60 min (Group B) and 239+/-61.71min (Group C), P < 0.004.* ***Conclusion:*** *Addition of buprenorphine (60 μg) or dexmedetomidine (5 μg) to intrathecal bupivacaine for lower abdominal surgery prolongs the time to the first analgesic request*

Keywords: *Anaesthesia, buprenorphine, dexmedetomidine, intrathecal.*

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I. Introduction

Spinal anaesthesia is commonly used regional anaesthesia technique for lower limb and lower abdominal surgeries for its advantages like quick onset, excellent sensory & motor block, very economical and easy to administer[1]. Postoperative pain control by spinal anaesthesia with local anaesthetic alone causes relatively short duration of action, thus early analgesic intervention is needed in post operative period.

Common problem during lower abdominal surgeries under spinal anaesthesia is visceral pain, nausea and vomiting. Use of higher doses of local anesthetics to avoid this may result in circulatory disturbances that can be difficult to manage as these patients are usually elderly and hence may have varying degrees of organ damage or associated systemic illness.

A combination of low-dose local anesthetics along with other adjuvants can prolong the postoperative analgesia. Hence, this has become an attractive option.

Several adjuvants such as opioids and Alpha 2 agonists have been studied in combination with intrathecal local anesthetics to improve the postoperative analgesia without compromising patient safety[1,2].

Dexmedetomidine is an alpha 2 adrenoreceptor agonist. It produces sedative and anxiolytic effects by its action on locus ceruleus of the brain stem. It also acts on dorsal horn neurons of spinal cord reducing the sympathetic discharge and also causes hyper polarization of dorsal horn cells. Buprenorphine is a opioid and it acts by stimulating kappa and mu opioid receptors and partially inhibiting delta opioid receptors. It has both spinal and supra spinal component of analgesia.

The objective of this study is to compare the efficacy of addition of buprenorphine or dexmedetomidine to bupivacaine in sensory and motor blockade duration, two segment regression and time of first analgesic requirement

II. Methods & Methodology

After obtaining approval from the Institutional Ethics Committee for the study and written informed consent from 60 participants, they were randomly allocated into three groups using computer generated list of random numbers.

Inclusion Criteria:

1. Age 50-70 years
2. either sex
3. ASA grade I & II
4. Posted for lower abdominal surgery

Exclusion Criteria:

1. Coagulopathy
2. Hypersensitive reaction to study drug
3. Previous spinal surgery
4. Infection at injection site
5. Neurological diseases

They are divided into 20 patients each into 3 groups.

Group A: received 15 mg of 0.5% hyperbaric bupivacaine along with 0.2 ml Normal saline intrathecally

Group B: received 15 mg of 0.5% hyperbaric bupivacaine along with 60 mcg of buprenorphine intrathecally.

Group C: received 15 mg of 0.5% hyperbaric bupivacaine along with 5 mcg of dexmedetomidine intrathecally.

After shifting to OR, 18 G IV cannula was secured in the hand & preloaded with 10 ml/ kg Ringer's lactate solution. Standard asa Monitors – ECG, Pulse oximeter, non invasive arterial pressure monitor were applied .

Subarachnoid block was done under strict aseptic conditions using 23G Quincke needle at L3-L4 space, the study drug was injected after confirming the free flow of cerebrospinal fluid. Oxygen 5 L/min by face mask was given to all patients.

Baseline Heart rate, mean arterial pressure were recorded before block.After performing the block same parameters were recorded every 5 mins for first 30 mins and then for every 10 mins till patients was shifted from OR.

Hypotension was said to occur when systolic blood pressure decreased by more than 20% from baseline or fall below 90 mmHg, it was treated with bolus fluid dose of 200 ml and incremental dose of 6 mg of mephentermine IV as required. Bradycardia was said to occur if heart rate is less than or equal to 50 beats/min, it was treated with 0.6 mg of atropine IV.

Sensory block levels were assessed by pinprick test every min for first 10 min or until T6 level was obtained. Time of regression of sensory blockade to S1 level were recorded.

The motor blockade was assessed using modified Bromage scale, time to regress the block to 0 in post-operative period was recorded.

Modified Bromage Scale:

0 = the subject is able to move the hips, knee and ankle
1 = the subject is unable to move the hip but not knee and ankle
2 = the subject is unable to move the hip and knee, but not ankle
3 = the subject is unable to move hip, knee, ankle

Sedation levels were assessed using Ramsay sedation score.

Ramsay Sedation Score:

1 = patient is anxious, agitated.
2 = patient is cooperative, oriented
3 = patient drowsy but responds to commands
4 = asleep, but with brisk response to glabellar tap or tactile stimulation
5 = asleep with a sluggish response to light glabellar tap or tactile stimulation and
6 = asleep and no response

The time for first analgesic requirement was noted. Number of patients requiring rescue analgesia (Tramadol hydrochloride 1mg/kg intravenous) in 24 hrs was noted. Postoperative complications like sedation, hyperglycaemia, pruritis if present were noted.

*Statistical Analysis:*SPSS 15 was used for statistical analysis.Based on a pilot study that was conducted on ten patients in each group, to find a difference of at least 2 h between the groups for time to first analgesic request, a sample size of 18 per group was needed for a power of 80% at 95% confidence interval. To compensate for any losses, 20 patients/group were assigned.Chi-square and fisher test were used for categorical

date. ANOVA test was used to assess the statistical difference between the three groups for continuous data.The value of $P < 0.05$ was considered statistically significant.

III. Results

There was no significant difference between patients demographic data, ASA status and duration of surgery(Table 1)

Table 1: showing demographic data

Variable	Group A	Group B	Group C	P-value
Age (years)	54+/- 11	53+/- 14	55+/- 12	0.878
Height (cms)	154+/-3	156+/-3.4	156+/-3.6	0.101
Weight (kgs)	64.5+/- 10.4	63+/- 10	62+/-9	0.723
Gender (Male/Female)	9/11	12/8	10/10	
Duration of Surgery (mins)	92+/-10	96+/-12	98+/-8	0.171

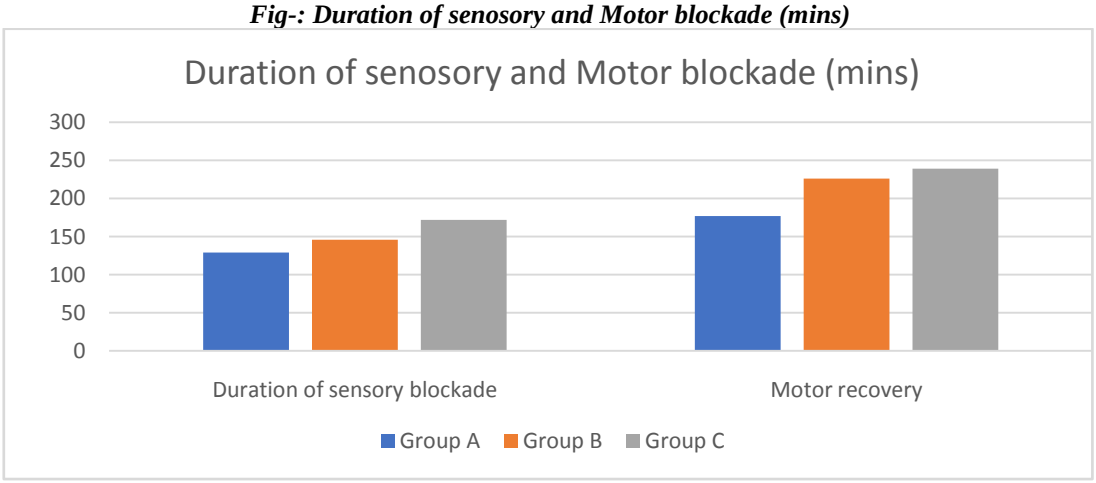
Group Cdexmedetomidine as adjuvant grouphas faster onset of sensory block (8+/-4) compared Group B & Group A (15 +/-4 &13+/-5 respectively) as in table 2

Table2: showing spinal anaesthesia characteristics

Variable (min)	Group A	Group B	Group C	P- value
Time to reach higher sensory block	13 +/- 5	15+/- 4	8+/-4	0.001
2-segment regression time	65.8+/-20.61	75.4+/-26.3	80.4+/-42	0.332
Duration of sensory blockade	129+/-44	146+/-53.6	172+/-58.7	0.0417
Motor recovery	177+/-56.9	226+/-60	239+/-61.71	0.0042
Time of first analgesia requirement	132+/-13.9	156+/-22.4	180+/-20.2	0.001

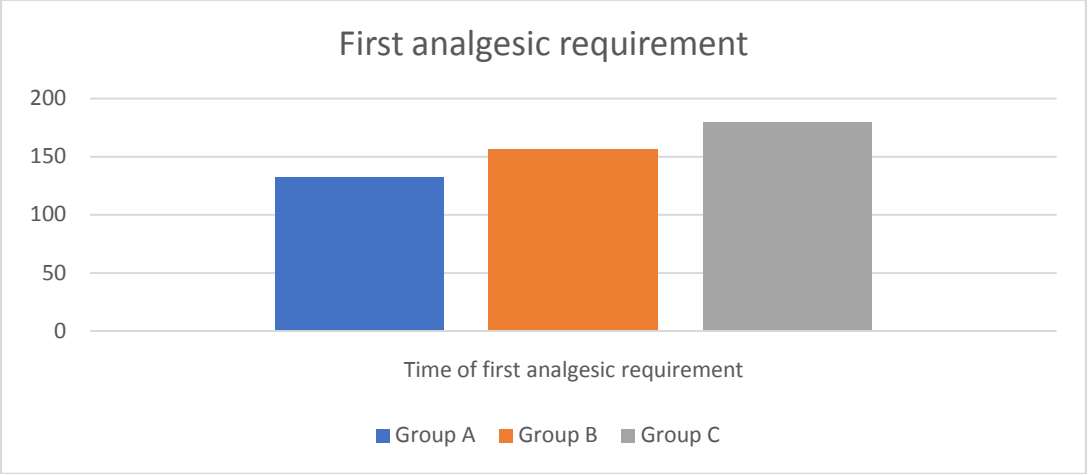
Duration of sensory blockade in Group C (172+/-58,7) is also significant compared to Group B & A (146±53.6 &129±44 respectively). Motor recovery in Group C (239±61.71) compared to Group B & A (226+/-60 & 177+/-56.9 respectively)(Fig-1)

Fig-: Duration of senosory and Motor blockade (mins)



The time of first analgesic requirement is prolonged in Group C (180+/-20.2) compared to Group B & A (156+/-22.4& 132+/-13.9 respectively) (Table 2 &Fig-2)and number of patients requiring tramadol IV in 24 hrs is 5, 8 & 12 (Table 3) in Groups C, B & A respectively.

Fig-2: First analgesic requirement



Six patients in the buprenorphine group had vomiting in the postoperative period and were treated with 0.1 mg/kg ondansetron IV. Two patients in dexmedetomidine group had transient hypotension following the injection of spinal anaesthesia needing a bolus of fluid bolus & single bolus of IV mephentermine 3 mg to maintain blood pressure within 30% of the baseline (Table 3). None of the patients had an SpO2< 90%.

Table 3: Number of Patients requiring atropine, Mephentermine and complications

Variables	**Group A**	**Group B**	**Group C**	**P- value**
Patient required atropine	1(5%)	2(10%)	2(10%)	0.829
Patient required Mephentermine	1(5%)	1(5%)	2(10%)	0.793
Patient required Tramadol IV in 24 hrs	12(60%)	8(40%)	5(25%)	0.357
Sedation	0	0	0	0
Pruritis	0	0	0	0

IV. Discussion

Dexmedetomidine is an alpha 2 adrenoreceptor agonist which has been increasingly used as an adjuvant for spinal anaesthesia for supra and infra umbilical surgeries.

Buprenorphine is partial opioid antagonist also used in number of studies as an adjuvant.

In our study no significant differences seen in hemodynamic parameters between the groups.In this study group c has significantly prolonged time of sensory spinal regression, motor regression and time of first analgesic requirement.

Kim et al. studied the effects of low dose of Intrathecal dexmedetomidine (3 µg) with bupivacaine in comparison to intrathecal saline with bupivacaine in elderly patients undergoing TURP[2].The authors reported a faster onset time to peak sensory motor effects and longer duration of motor and sensory blockade and longer duration of first analgesic request in the dexmedetomidine group.

Kanazi GE, and his co-workers concluded that 3 µg dexmedetomidine when added to intrathecal bupivacaine for spinal anesthesia resulted in rapid onset motor block, prolonged the duration of motor and sensory block, and there were no hemodynamic derangement and it didn't cause sedation[3].

Maharani et al. had done a similar study and reported that dexmedetomidine 10 mcg has longer sensory and motor duration compared with buprenorphine 60 mcg added to hyperbaric bupivacaine intrathecally but has increase incidence of nausea, vomiting and respiratory depression in patients undergoing infra-umbilical and lower limb surgeries. In our study, lower doses of both adjuvant drugs were used with no incidence of respiratory depression in any of the patient groups[4].

Gupta et al. compared intrathecal dexmedetomidine and buprenorphine to bupivacaine in doses similar to that used in our study for lower abdominal surgeries. The authors reported Intrathecal dexmedetomidine when compared to intrathecal buprenorphine causes prolonged anaesthesia and analgesia with reduced need for sedation and rescue analgesics[5].

The incidence of nausea and vomiting was higher with intrathecal buprenorphine which correlates with the findings of other studies.Two patients who received intrathecal dexmedetomidine developed transient hypotension that was easily treated with fluid bolus IV followed by mephentermine IV. The limitations of study isquantitatively measurement of postoperative pain using scores such as visual analogue scale was not done.

V. Conclusion

Addition of buprenorphine (60 μg) or dexmedetomidine (5 μg) to intrathecal bupivacaine for lower abdominal surgery prolongs the time to the first analgesic request with comparable recovery profile. The group with dexmedetomidine as an adjuvant had significant longer period of motor and sensory blockade compared to other groups.

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