

ORIGINAL RESEARCH

Comparison of Dexmedetomidine 2 mcg with Clonidine 50 mcg Adding to 12.5 mg of 0.5% Heavy Bupivacaine for Spinal Anaesthesia in Lower Abdominal Surgeries

G. Pratapa Reddy¹, M. Praveen Kumar²

ABSTRACT

Introduction: Newer alpha2 agonists have opened a new chapter in the history of postoperative analgesia.

Material and method: 60 adult patients of ASA I and II are divided into two groups of 30 each. Group D received inj. Bupivacaine (12.5mg) with Dexmedetomidine (2 mcg) intrathecally and Group C received inj. Bupivacaine (12.5mg) with Clonidine (50 mcg) intrathecally. Onset and duration of sensory and motor blockade were assessed. Pulse rate, blood pressure were recorded pre operatively, intraoperatively at 0, 5, 15, 30, 60, 90 min and at end of surgery and post operatively every 15 min.

Results: Time for onset of sensory block was significantly shorter in group D than in group C (83 ± 32.42 sec in group D Vs 115 ± 39.35 sec in group C, $p=0.001$). The onset of motor blockade was delayed in group-D when compared to group-C and the difference was statistically not significant (191.23 ± 98.04 sec in group D vs 171.75 ± 57.75 sec in group C, $p=0.2$). The duration of analgesia was more in group-D when compared to group-C (374.34 ± 44.54 min in group-D and 302.5 ± 29.18 min in group-C, $p= 0.0001$). The duration of motor block was significantly more in group-D when compared to group-C (317 ± 32 min in group-D and 220 ± 48 min in group-C, $p=0.0001$). There was no much change in the hemodynamic condition of the patients (pulse rate and mean arterial pressure).

Conclusion: It can be concluded that Dexmedetomidine has a faster onset of sensory block than Clonidine. Dexmedetomidine prolongs the duration of sensory and motor block of Bupivacaine than Clonidine.

Keywords: Dexmedetomidine, clonidine, bupivacaine

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INTRODUCTION

Spinal anaesthesia is commonly employed for lower abdominal surgeries. Various adjuvants have been used to prolong the analgesic effect of Bupivacaine. An adjuvant (from Latin, adjuvare: to aid), is a pharmacological or immunological agent that modifies the effect of other agents, such as a drug or vaccine.¹

Adjuvants are drugs that increase the efficacy or potency of other drugs when given concurrently. Neuraxial adjuvants are used to improve or to prolong analgesia and decrease the adverse effects associated with high doses of a single local anaesthetic agent. In addition to their dose sparing effects, neuraxial adjuvants are also utilized to increase the speed of onset of neural blockade, improve the quality and prolong the duration of neural blockade.²

Neuraxial adjuvants include Opioids, α -2 adrenoceptor agonists, N-methyl-D-aspartate (NMDA) antagonists, cholinergic agonists and vasoconstrictors. Intrathecal α -2 agonists have become very popular among surgeons and anaesthesiologists as an adjuvant to Bupivacaine. Results of the previous studies show that addition of either of these two agents intrathecally significantly prolongs the duration of both sensory and motor analgesia of hyperbaric Bupivacaine.³

Clonidine has been used extensively and studied as an adjuvant to Bupivacaine in almost all the types of nerve blocks. The mechanism of action of Dexmedetomidine differs from Clonidine as it possesses selective alpha 2 adrenoceptor agonistic activity especially for the 2A subtype of this receptor, which causes it to be a much more effective sedative and analgesic agent than Clonidine.⁴

While Clonidine has been in use as an adjuvant to Bupivacaine in subarachnoid block, there are only a few studies available on human upon intrathecal uses of Dexmedetomidine. Therefore we designed this study to compare the effect and side effects of addition of Clonidine and Dexmedetomidine to intrathecal hyperbaric Bupivacaine.

METHODS AND MATERIALS

This study was conducted at Narayana medical college and Hospital, Nellore between May 2011 to October 2013 on 60 patients of ASA I and II undergoing lower abdominal surgeries. This study was done after Ethical Committee approval and written informed consent was obtained from all patients.

Study design

This study was done in a prospective double blinded randomized manner.

Selection of cases

Inclusion criteria

- Patients in age group of 20 to 50 yrs.
- ASA – I & II
- Lower abdominal surgeries.

Exclusion criteria

- ASA – III & IV
- Patient refusal
- Renal / hepatic dysfunction
- Allergy to drugs
- Contra indication to sub arachnoid block.
- Treatment with alpha 2 adrenergic antagonists
- Labile hypertension

60 patients were included in this double blinded randomized controlled study. Patients were divided into 2 groups.

Patients in group C received 2.5ml of 0.5% hyperbaric Bupivacaine with 50 µg of Clonidine.

Patients in group D received 2.5 ml of 0.5% hyperbaric Bupivacaine with 2 µg of Dexmedetomidine.

Pre anaesthetic evaluation

Patients included in the study underwent thorough pre operative evaluation which included the following.

History

History of underlying medical illness, previous surgery, anaesthesia and hospitalization are noted. Patients were advised overnight fasting.

Physical examination

- General condition of the patient

- Vital signs
- Height and weight
- Examination of CVS,RS, CNS and vertebral column
- Airway assessment

Investigations

Hb, PCV, BT, CT, RFT, blood sugar, ECG, CXR, platelet count, blood grouping and cross matching were done.

Patients who satisfied the inclusion criteria were explained about the nature of the study and the anaesthetic procedure.

Written informed consent was obtained from all patients included in the study.

How double blinding was done

Allotment of cases was done by computerized lots. The consultant who made the drug combination took no further part in the study. I performed the subarachnoid block and made intraoperative observations. Post-operatively in the recovery room, observations were done.

TECHNIQUE

In the OT, appropriate equipment for airway management and emergency drugs were kept ready. Patient was shifted from premedication room to the OT after giving oral Alprozalolam 0.5mg 2hrs prior to surgery. The horizontal position of the operating table was checked and patient shifted to the table, I.V. line was started and intra venous fluids started. NIBP, SpO₂, ECG leads were connected to the patient. Pre operative baseline systolic and diastolic BP, PR, SpO₂ and RR were recorded. SAB and done and observations were made in all the patients involved in the study. Under strict aseptic precautions a midline lumbar puncture was performed using a 25G Quincke needle in lateral decubitus position. The patient was then immediately placed in supine position. Lumbar puncture was successful in first attempt in almost all patients. The time for intrathecal injection was considered as 0 and the following parameters were observed – onset of sensory blockade was taken as loss of sensation to temperature by spirit swab at L2 level. Onset of motor block was taken as Bromage scale 1. Respiratory rate, sedation and any other complications were observed.

Vital signs and side effects

The PR, systolic and diastolic BP, SpO₂ and RR were recorded pre operatively, 0 min, 5 min, 15 min, 30 min, 60 min and 90 min and at the end of surgery. Hypo-

tension was defined as fall in systolic BP > 30 % from baseline or MAP <60 mmHg. This was managed with inj. Ephedrine 6mg increments. Bradycardia was defined as HR <50 /min and this was managed with Inj. Atropine 0.01mg/kg i.v.

Respiratory depression defined as RR< 8/min and or SpO₂ <85%. This was planned to be managed with bag and mask ventilation or intubation and IPPV if necessary. Blood loss more than the allowable loss was replaced with blood. The occurrence of sedation was assessed using Ramsay sedation scale.

Assessment in recovery room

Patient was shifted to recovery room after completion of surgery, the vital signs were recorded, every 30 mins interval. Sensory and motor block assessments were done every 15 mins till recovery of pin prick sensation to L1 and BROMAGE scale of 1 respectively. Patients were shifted to post operative ward after complete resolution of motor blockade.

Assessment of pain and duration of analgesia

In the recovery room pain assessment using VAS were done every 15 mins. At the end of surgery, the degree of pain was assessed using VAS scale till VAS score >4 was reached. Whenever the patient complained of pain and rescue analgesic Inj. Diclofenac 75mg i.m was given. Duration of effective analgesia was defined as time interval between onset of SAB and the time to reach VAS >=4.

Patients were monitored for 24 hrs to detect the occurrence of side effects - respiratory depression, nausea, vomiting, dry mouth and pruritis. Patients were also enquired about the occurrence of Transient neurological symptoms which was described as pain / paresthesia in the buttocks, legs or pain radiating to lower extremities after initial recovery from SAB within 72 hrs.

Variables	Group D	Group C
Age (yrs)	40.8 ± 9.17	39.5 ± 11.43
Sex (F/M)	12/18	13/17
Height (cms)	156.6 ± 4.85	161.4 ± 4.65

Table-1: Demographic data

	Group-D	Group-C	t- Value	p-Value
Duration of surgery (min)	116 ± 64.7	161 ± 70	0.4873	0.660
Onset of sensory blockade (sec)	83 ± 32.42	115 ± 39.35	3.4377	0.0011
Onset of motor blockade (sec)	191.2 ± 98.04	141.7 ± 51.75	2.5939	0.0120
Duration of analgesia (min)	374.34 ± 44.54	302.5 ± 29.18	7.3897	0.0001
Duration of motor block (min)	317 ± 32	220 ± 48	9.2096	0.0001
Maximum sensory level achieved	T6 ± 1.2	T6 ± 1.2	0.000	1.000

Table-2: Onset and duration of sensory and motor blockade among two groups

STATISTICAL ANALYSIS

All recorded data were entered using MS Excel software and analysed using SPSS software for determining the statistical significance. Analysis of Variance was used to study the significance of mean of various study parameters between the two groups. Student's t test was used to compare the two groups on mean values of various parameters. The p-value <0.05 is considered significant. Data is presented as mean ± SD or numbers (n).

RESULTS

Group-D = Dexmedetomidine group

Group-C = Clonidine group

The demographic data reveals that all 3 groups are comparable in age, height, and sex ratios. There is no statistically significant difference between the groups with regard to demographic data. There is no statistical significance among the groups with respect to age. There is no statistical significance among the groups with respect to gender. There is no statistical significance among the groups with respect to height.

There is no significant difference in the duration of surgery in both the groups. There is significant difference in the duration of analgesia, duration for duration of motor block and onset of sensory and motor blockade. The onset of sensory blockade was shorter in Dexmedetomidine group than in Clonidine group. The onset of motor blockade was delayed in Dexmedetomidine group when compared to Clonidine group. The duration of analgesia and motor blockade was more for Dexmedetomidine group than Clonidine group.

DISCUSSION

When we compared the Dexmedetomidine and Clonidine with each other, we found that onset of motor block was delayed with Dexmedetomidine as compared to Clonidine. The difference was statistically insignificant [191.23 ± 98.04 sec in group D vs 171.75 ± 57.75 sec in group C, p=0.2]. Onset of sensory block was delayed with Clonidine as compared to Dexmedetomidine

	Nausea	Brady- cardia	Hypo- tension	Seda- tion
Group-D	1	2	3	1
Group-C	1	3	4	1

Table-3: Complications among two groups

[83 ± 32.42 sec in group D Vs 115 ± 39.35 sec in group C, p=0.001]. The difference was statistically significant. Dexmedetomidine produced significantly longer duration of sensory and motor block as compared to Clonidine. Regression time of sensory block was 374.34 ± 44.54 min for Dexmedetomidine as compared to 302.5 ± 29.18 min for Clonidine. Regression time to reach Bromage 1 was 317 ± 32 min for Dexmedetomidine as compared to 220 ± 48 min for Clonidine. When we searched the literature we found that very few authors have compared intrathecal Dexmedetomidine to Clonidine.

Rampal Singh and Aparna Shukla⁵ in their study divided the patients into 3 groups. Group A, B and C patients received inj. bupivacaine (15 mg) intrathecally with normal saline, with clonidine (50 mcg) and with Dexmedetomidine (5 mcg) respectively. Onset time of sensory and motor block was greater in group B and C. Regression time of sensory block to S1 dermatome was significantly higher in group A vs B, group A vs C and group B vs C (210.0±32.69 min, 268.93±62.75 min and 404.43±114.83 min for group A,B and C respectively). Regression time to reach bromage 1 was significantly high in group B and C as compared to A (172.11±29.77 min, 231.93±70.57 min and 309.93±101.71 min for group A, B and C respectively) [group B vs C: t=3.451; p=0.001]. Heart rate and mean arterial pressure remained at significantly lower level in Group B and Group C as compared to Group A. They concluded that though both Clonidine and Dexmedetomidine prolonged duration of sensory and motor block of Bupivacaine, Dexmedetomidine is better in terms of longer duration of action.

Sukhminder Jit Singh Bajwa⁶ concluded that addition of Dexmedetomidine to Ropivacaine as an adjuvant resulted in an earlier onset (8.52 ± 2.36 min) of sensory analgesia at T10 level as compared to the addition of Clonidine (9.72 ± 3.44 min). Dexmedetomidine not only provided a higher dermatomal spread but also helped in achieving the maximum sensory anaesthetic level in a shorter period (13.14 ± 3.96 min) compared to Clonidine (15.80 ± 4.86 min). Modified Bromage scale 3 was achieved earlier (17.24 ± 5.16 min) in patients who were administered Dexmedetomidine as adjuvant. G. E. Kanazi³ studied the effect of low-dose Dexmedetomidine or Clonidine on hyperbaric Bupivacaine. In

a prospective, double-blind study, 60 patients undergoing transurethral resection of prostate or bladder tumor under spinal anaesthesia were randomly allocated to one of three groups. Group B patients received 12 mg of hyperbaric Bupivacaine, group D patients received 12 mg of Bupivacaine supplemented with 3mcg of Dexmedetomidine and group C patients received 12 mg of Bupivacaine supplemented with 30 mcg of Clonidine. The mean time of sensory regression to the S1 segment was 303 ± 75 min in group D, 272 ± 38 min in group C and 190 ± 48 min in group B (B vs. D and B vs. C, P < 0.001). The regression of motor block to Bromage 0 was 250 ± 76 min in group D, 216 ± 35 min in group C and 163 ± 47 min in group B (B vs. D and B vs. C, P < 0.001). They opined that Dexmedetomidine (3 mcg) or Clonidine (30 mcg), when added to intrathecal Bupivacaine, produces a similar prolongation in the duration of the motor and sensory block with preserved hemodynamic stability and lack of sedation.

In our study, patients remained hemodynamically stable in both Dexmedetomidine and Clonidine groups. Patients in Clonidine group had a greater fall in heart rates than in Dexmedetomidine groups, and the difference was statistically significant. There was no much fall in blood pressure and heart rate when compared to the baseline values.

Mahmoud M. Al-Mustafa⁷ added Dexmedetomidine to spinal Bupivacaine for urological procedures. He compared 5mcg (group D5) and 10 mcg (group D10) of Dexmedetomidine added to 12.5 mg Bupivacaine to Bupivacaine 12.5 mg with normal saline (control group). The author found that the mean time of sensory block to reach T10 dermatome was 4.7±2.0 minute in D10 group, 6.3±2.7 minute in D5 group and 9.5±3.0 minute in control group. The mean time to reach Bromage 3 scales was 10.4±3.4 minute in D10 group, 13.0±3.4 minute in D5 group and 18.0 ± 3.3 minute in control group. Regression time to reach S1 dermatome was 338.9±44.8 minute in D10 group, 277.1±33.2 minute in D5 group and 165.5 ± 32.9 minute in control group. Time to reach Bromage 0 was 302.9±36.7 minute in D10 group, 246.4.1±24.7 minute in D5 group and 140.1 ± 32.3 minute in control group. They opined that Dexmedetomidine has dose dependent effect on onset and regression of sensory and motor block.

Subhi M. Al-Ghanem⁸, evaluated the onset and duration of sensory and motor block as well as operative analgesia and adverse effects of Dexmedetomidine (5 µg) or Fentanyl (25 µg) given intrathecally with plain 0.5% Bupivacaine (10mg) for spinal anaesthesia. Patients in Dexmedetomidine group (D) had significant longer sensory and motor block as compared to patients in

fentanyl group (F). The time to reach the maximal sensory block was 19.34 ± 2.87 min. for group D and 18.39 ± 2.46 min. for Group F ($p = 0.126$) The onset time of modified Bromage 3 motor block was also not different between group D and F; 14.4 ± 6.7 and 14.3 ± 5.7 min. respectively ($P = 0.93$). The mean time of sensory regression to S1 was 274 ± 73 min in group D and 179 ± 47 min in group F ($P < 0.001$). The regression time of motor block to reach modified Bromage 0 was 240 ± 60 min in group D and 155 ± 46 min in group F ($P < 0.001$). Hypotension was mild to moderate in both groups except one patient in group F, who had a blood pressure less than 90 mmHg, and required 36 mg ephedrine to restore his blood pressure They concluded that in women undergoing vaginal reconstructive surgery under spinal anaesthesia, 10 mg plain Bupivacaine supplemented with 5 µg (microgram) Dexmedetomidine produces prolonged motor and sensory block compared with 25 µg Fentanyl.

Van Tuij⁹, added various doses of Clonidine (0, 15 or 30 µg) to 5 mg hyperbaric Bupivacaine and evaluated their effect on the duration of the motor block, analgesic quality and ability to void. They opined that addition of 15 and 30 µg of Clonidine increased the motor block duration by 25 and 34 min, respectively and also resulted in better analgesic quality.

Strebel S et al.¹⁰ examined the dose-response relationship of intrathecal Clonidine at small doses (≤ 150 µg) with respect to prolonging Bupivacaine spinal anaesthesia. Eighty orthopaedic patients were randomly assigned to receive 18 mg of isobaric 0.5% Bupivacaine intrathecally plus saline (Group 1), Clonidine 37.5 mcg (Group 2), Clonidine 75mcg (Group 3), and Clonidine 150mcg (Group 4). Duration of the sensory block (regression below level L1) was increased in patients receiving intrathecal Clonidine, 288 ± 62 min (Group 1, control), 311 ± 101 min in Group 2, 325 ± 69 min in Group 3, and 337 ± 78 min in Group 4. They concluded that small doses of intrathecal Clonidine (≤ 150 µg) significantly prolongs the anaesthetic and analgesic effects of Bupivacaine in a dose-dependent manner.

CONCLUSION

On the basis of the observations made during this study and their analysis, the following conclusion was drawn: Addition of Dexmedetomidine 2µg to 0.5% heavy Bupivacaine intrathecally produced faster onset of sensory blockade, longer duration of analgesia and motor blockade and better haemodynamic stability than Clonidine 50µg.

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