



USE OF DEXMEDETOMIDINE AS AN ADJUVANT TO 0.5% HYPERBARIC BUPIVACAINE IN SUBARACHNOID BLOCK

Anaesthesiology

Dr. Dhananjay Yadav	M.D. Anaesthesia, Senior Resident, Dept. Of Anaesthesia & Critical Care, S. N. Medical College, Agra (U.P)
Dr. Suman Minocha*	M.D. Anaesthesia, Asst. Prof, Dept. Of Anaesthesia & Critical Care, S. N. Medical College, Agra (U.P) * Corresponding Author
Dr. Anamika Mishra	M.D. Anaesthesia, Senior Resident, Dept. Of Anaesthesia & Critical Care, S. N. Medical College, Agra (U.P)
Dr. Deepak Joshi	M.D. Anaesthesia, Asso. prof., Dept. Of Anaesthesia, R.D. Gardi Medical College, Ujjain (M.P)

ABSTRACT

The present study aimed at clinical evaluation of dexmedetomidine 10 microgm, as an adjuvant to heavy bupivacaine 0.5% (4 ml) in subarachnoid block in patients scheduled for lower abdominal surgeries.

Total no. of patients included in the study are 66 who are admitted in orthopaedic ward for lower limb surgeries, who are of ASA grade I & II and age group between 18-60yrs. All the routine investigations of the patients were done and after complete PAC and preoperative preparations, patients were taken into O.T, all the standard monitoring applied and for subarachnoid block hyperbaric Bupivacaine 0.5% is a dose of 4ml (20mg) combined with or without Dexmedetomidine was administered according to the assigned study group:

1. Group A- Inj. Bupivacaine- 20mg alone- control group

2. Group B- Inj. Bupivacaine- 20mg with Dexmedetomidine 10mcg- study group

Data on onset & offset of sensory & motor block, degree of muscle relaxation, postoperative pain free period were recorded. Dermatome level of block, vitals & drug related complications were also noted.

On the basis of observations, following conclusions are drawn: Rapid onset & increased duration of sensory block was seen in Grp B, Onset of motor block & post operative pain free period was prolonged in Grp. B.

Sedation score was from 0-2 in study group. Other complications in study group were not significant.

KEYWORDS

Subarachnoid Block, Bupivacaine, Dexmedetomidine, Analgesia.

INTRODUCTION

One of the basic reasons to add neuraxial adjuvant drugs with heavy Bupivacaine to subarachnoid block, is to extend postoperative pain relief by prolonging the duration of sensory block. Subarachnoid block is a safe and effective alternative to general anaesthesia when surgical site is located on the lower extremities, perineum and lower abdominal wall. As most of the lower abdominal surgeries are done under subarachnoid block, a neuraxial adjuvant not only prolongs the duration postoperative analgesia but is also effective in attenuating this poorly localizing visceral pain.

Carl Koller, an ophthalmologist from Vienna has described the use of topical cocaine for the analgesia of eye in 1884. In 1885, the administration of spinal analgesia by Leonard corn, a neurologist in New York for the first time on dog, spinal anaesthesia has progressed since then and is used successfully in number of clinical situations. The first planned spinal anaesthesia for surgery in a man was administered by August Bier on 16 August 1898, in Keil, when he injected 3 ml of 0.5% cocaine solution intrathecally in 34 year old labourer. Since then spinal anaesthesia faced many changes. Many drugs have been used and studied.

With the discovery of Amide local anaesthetic agent, spinal anaesthesia has been revolutionized. They are long lasting and safer drugs. Lignocaine since 1949 had been the main agent but it becomes less popular after reporting of Cauda Equina Syndrome.

Bupivacaine is a well established and most widely used long acting regional anaesthetics, which like all amide anaesthetic have been associated with cardio toxicity when used in high concentration or when accidentally, administered IV. The efficiency and tolerability of Bupivacaine for spinal anaesthesia in lower abdominal and lower limb surgery have been demonstrated in several studies. It has shown to produce sufficient surgical anaesthesia and analgesia and consistently shown to reduce side effect profile. Due to its propensity of blocking sensory fiber readily, it serves all purposes for day care surgery. Patient can be mobilized early and discharge sooner.

Dexmedetomidine is selective Alfa 2 adrenoreceptor agonist that modulate antinociception by inhibiting peripheral norepinephrine release thus terminating the propagation of pain signal. At same time post synaptic activation of Alfa 2 adrenoreceptor in the central nervous system inhibit sympathetic activity and may result in hypotension and bradycardia. On the basis of past clinical studies it was observed that Intrathecal dexmedetomidine 10 mcg with bupivacaine do not causes major hemodynamic changes and is a safe adjuvant for post operative analgesia along with bupivacaine.

In view of pharmacological properties of dexmedetomidine, a clinical study was planned with an aim to compare the post operative analgesic and sedative effect of dexmedetomidine used in subarachnoid block as an adjuvant to bupivacaine in patients undergoing lower abdominal surgeries.

MATERIAL & METHODS

The present study carried out in the department of anaesthesia after approval from the ethics committee of college and Hospital, on 66 Patients admitted in orthopaedic ward undergoing surgery on lower limb under spinal anaesthesia.

During preoperative visit, each patient was subject to detailed physical and systematic examination to record vital signs, and to rule out any general or local diseases or deformity of spine. The relevant history regarding previous illness was obtained and recorded.

Each patient was investigated under:-

- Complete Urine examination.
- Haemoglobin estimation and complete blood count.
- Fasting blood glucose.
- Serum creatinine.
- Chest x-ray and E.C.G. studies of patients having medical history suggesting cardio-respiratory problem.
- All the patient undergoing spinal anaesthesia were explained regarding the procedure and prior consent for the procedure was obtained

Inclusion criteria-

- All patients of ASA grade 1 & 2.
- All patients of age group between 18 to 60 years.
- Patient who were disqualified from the study (Exclusion criteria)
- Patient refusal for the procedure.
- Sensitive to local anaesthetics.
- History of allergic reaction or abnormal response to the drug.
- Patient on anticoagulant therapy.
- Bleeding disorder and disturbed coagulation profile.
- Patients using alpha-2 receptors antagonists, calcium-channels-blockers and angiotensin converting enzyme inhibitors.
- Infection in the site of injection.
- Spinal abnormality like kyphosis, scoliosis, lordosis, previous spine surgery.
- Presence of Co-morbid diseases contraindicating spinal subarachnoid block.

All patients were kept NBM after 10 PM and Tab Alprazolam 0.5 mg was given orally H.S. for completely night sleep. IV line was secured with 18 SWG cannula and infusion of RL was started.

The spinal anaesthesia was administrated in a well equipped O.T. with all emergency and essential drugs.

Spinal block was administrated in sitting position by mid line approach. The patient was asked to sit up on the operating table and the back was moved as close to the edge of the table.

The patient was asked to 'Hunch over' so that the lower back is flexed. The objective of keeping patient in such position was to make the interspaces wide for an essay approach to the subarachnoid space. The position was maintained with the help of assistants.

- Back was prepared with antiseptic solution, in the wards before being shifted to the theatre.
- Surgical scrub was done and sterile gown and gloves were put on.
- A large area of skin (from buttocks to the angle of scapula) was painted with savlon, povidone iodine and then with the spirit and finally dry with the dry gauze.
- Local anaesthesia solution for spinal block and infiltration solution were drawn in separate syringes.
- 1ml of test drug Dexmedetomidine was drawn in insulin syringe.
- As per the assigned study group 0, 10mcg or 15mcg of Dexmedetomidine was mixed with local anaesthetic solution for injection in subarachnoid space.
- A sterile towel sheet was placed across the buttocks. The landmarks were identified.
- A widest space was selected for the lumbar puncture.
- Skin and deep tissue were infiltrated with 2% lignocaine.
- Stylet and spinal needle were checked.
- The spinal needle was then directed till the duramater was punctured in L3/L4 interspace identifying the intercreastic line.
- The stylet was removed and free flow of C.S.F. was observed.
- After performing lumbar puncture hyperbaric Bupivacaine 0.5% is a dose of 4ml(20mg) combined with or without Dexmedetomidine was administrated according to the assigned study group:

1. Group A- Inj. Bupivacaine- 20mg alone.
 2. Group B- Inj. Bupivacaine- 20mg with Dexmedetomidine 10mcg.
- The syringe along with the needle was withdrawn; the wound was dressed with sterile gauze soaked in Tincture Benzoin.
 - A 10 degree head tilt was given to all patients after making them in supine position on table.

All patients were oxygenated by facemask @ 4L/min.

After subarachnoid injection of drug/ drugs according to the assigned group, patients were observed for-

- Onset time of sensory blocks.
- Height of sensory blocks
- Duration of sensory block
- Onset time of motor block
- Height of motor block
- Duration of motor block
- Duration of post operative analgesia
- Sedation score
- Associated hemodynamic changes
- Complications and side effects

- Throughout surgery patients were monitored continuously on a multi-parameter monitor ECG, NIBP, sPO2 and recorded at 5, 10, 15, 20, 25 and 30 minute and then at every fifteen minutes after the administration of drugs in subarachnoid space until the surgery ends or up till 2 hours which ever come fast.
- Injection Atropine and injection Ephedrine was given intravenously on occurrence of significant Bradycardia or hypotension.
- After the operation was over, the pulse, blood pressure was again recorded and patient was shifted to recovery area.
- After the sensory and motor recovery, the patient was shifted to the ward and observed for time of occurrence of pain and time of administration of rescue analgesic injection Diclofenac sodium by intramuscular route was recorded.
- All the observation recorded in the predefined proforma and readings were subjected to statistical analysis.
- The results were tabulated and presented in the form of table and diagrams.
- Observations recorded were discussed in reference of available literature and were reviewed to arrive at conclusion

RESULTS & DISCUSSION

Table No.1 Distribution according to high sensory level achieved in bupivacaine and bupivacaine + dexmedetomidine group

Highest Sensory Level	Bupivacaine Group		Bupivacaine + Dexmedetomidine Group	
	Number	Percentage	Number	Percentage
T10	6	18.2	6	18.2
T8	19	57.6	12	36.4
T6	8	24.2	15	45.5
Total	33	100.0	33	100.0

Pearson Chi-square value = 3.711, df=2, P value = 0.156, Not Significant

In the bupivacaine group, 6 (18.2%) patients reached T10 level, 19 (57.6%) patients reached T8 level and 8 (24.2%) patients reached T6 level.

In the bupivacaine + dexmedetomidine group, 6 (18.2%) patients reached T10 level, 12 (36.4%) patients reached T8 level and 15 (45.5%) patients reached T6 level.

The association between the highest sensory level and the groups was found to be statistically not significant ($p>0.05$), showing that the groups are independent of the highest sensory level reached.

Table No.2 Comparison of mean onset of sensory block between the bupivacaine and bupivacaine + dexmedetomidine group

Group	Mean $\pm$ SD	't' value	P value
Bupivacaine	92.45 $\pm$ 14.42	2.131, df=64	0.037,
Bupivacaine + Dexmedetomidine	86.39 $\pm$ 7.67		

Unpaired 't' test applied. P value = 0.037

The difference of mean onset of sensory block in bupivacaine & bupivacaine+dexmedetomidine group was found to be statistically significant, showing a rapid onset of sensory block in bupivacaine+dexmedetomidine group.

Table No.3 Comparison of mean onset of motor block between the bupivacaine and bupivacaine + dexmedetomidine group

Group	Mean $\pm$ SD	't' value	P value
Bupivacaine	117.21 $\pm$ 29.11	4.098, df=64	0.000*
Bupivacaine + Dexmedetomidine	95.24 $\pm$ 10.08		

Unpaired 't' test applied. P value = 0.000, Significant

Table No.4 Comparison of mean duration of motor block between the bupivacaine and bupivacaine + dexmedetomidine group

Group	Mean $\pm$ SD	't' value	P value
Bupivacaine	180.45 $\pm$ 37.58	-3.739, df=64	0.000*
Bupivacaine + Dexmedetomidine	206.70 $\pm$ 14.62		

Unpaired 't' test applied. P value = 0.000, Significant

The difference between mean duration of motor block between 2 groups was found to be significant, showing a higher mean duration in the bupivacaine+dexmedetomidine group.

Table No.5 Comparison of mean time to first analgesia between the bupivacaine and bupivacaine + dexmedetomidine group

Group	Mean $\pm$ SD	't' value	P value
Bupivacaine	183.45 $\pm$ 37.34	-4.460, df=64	0.000*
Bupivacaine + Dexmedetomidine	215.00 $\pm$ 16.03		

Unpaired 't' test applied. P value = 0.000, Significant

The difference was statistically significant ($p < 0.05$), showing a higher mean time to first analgesia requirement in bupivacaine + dexmedetomidine group.

Table No. 6 Comparison of mean sedation score between the bupivacaine and bupivacaine + dexmedetomidine group

Group	Mean $\pm$ SD	't' value	P value
Bupivacaine	0.58 $\pm$ 0.50	-1.728, df=64	0.089,
Bupivacaine + Dexmedetomidine	0.85 $\pm$ 0.76		

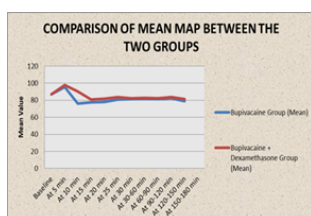
Unpaired 't' test applied. P value = 0.049, Significant

The difference was statistically significant showing a comparable mean sedation score in both the groups.

Table No.7 Comparison of mean MAP at different time intervals in the bupivacaine group

MAP	Bupivacaine Group (n=33)		't' value	P value
	No.	Mean $\pm$ SD		
Baseline	33	86.88 $\pm$ 8.77		
At 5 min	33	95.36 $\pm$ 6.53	-4.234, df=32	0.000*
At 10 min	33	76.27 $\pm$ 15.09	3.304, df=32	0.002*
At 15 min	33	77.42 $\pm$ 5.31	4.813, df=32	0.000*
At 20 min	33	78.12 $\pm$ 6.00	4.948, df=32	0.000*
At 25 min	33	80.94 $\pm$ 5.31	3.151, df=32	0.004*
At 30 min	33	81.27 $\pm$ 5.45	3.307, df=32	0.002*
At 30-60 min	33	81.97 $\pm$ 6.63	2.403, df=32	0.022*
At 60-90 min	33	81.42 $\pm$ 5.26		
At 90-120 min	28	82.43 $\pm$ 6.56	2.086, df=27	0.047*
At 120-150 min	9	79.00 $\pm$ 3.74	1.797, df=8	0.110, NS
At 150-180 min	0	0.00 $\pm$ 0.00	-	-

Paired 't' test applied. P value < 0.05 was taken as statistically significant.



In the bupivacaine group, there was an increase at 5 minutes, then a fall at 10 minutes, then remained stable till 20 minutes, then a slight increase at 25 minutes till 30-60 minutes, then a slight fall at 60-90 minutes, then a slight increase at 90-120 minutes, then a slight fall at 120-150 minutes.

In the bupivacaine + dexmedetomidine group, there was an increase at 5 minutes, then a fall at 10 minutes, which continued till 15 minutes, then a slight increase at 20 minutes which continued till 25 minutes, then a slight fall at 30 minutes, which remained stable till 90-120 minutes and then a slight fall at 120-150 minutes.

The mean MAP was statistically higher in the bupivacaine + dexmedetomidine group in comparison to the bupivacaine group at 15 minutes, 20 minutes, 25 minutes ($p < 0.05$), while it was comparable at all the other time intervals ($p > 0.05$).

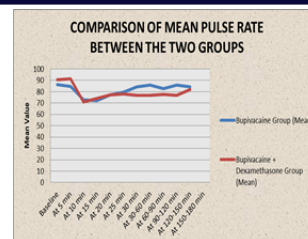


Table No.9 Distribution according to adverse events in bupivacaine and bupivacaine + dexmedetomidine group

Adverse Events	Bupivacaine Group		Bupivacaine + Dexmedetomidine Group	
	Number	%	Number	%
None	14	42.4	22	66.7
Bradycardia	7	21.2	7	21.2
Hypotension	9	27.3	4	12.1
Shivering	2	6.1	0	0.0
Vomiting	3	9.1	2	6.1

CONCLUSION

In our study we found that Dexmedetomidine (10mcg), when used as an adjunct to 20mg(4ml), 0.5% hyperbaric bupivacaine prolongs the duration of effective analgesia in the immediate postoperative period without any significant hemodynamic instability. The mild sedation resulting from intrathecal dexmedetomidine may be beneficial in procedures.

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