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Original Research Paper

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A COMPARISON BETWEEN INTRATHECAL DEXMEDETOMIDINE AND CLONIDINE AS ADJUVANT TO HYPERBARIC BUPIVACAINE IN SPINAL ANAESTHESIA FOR UROLOGICAL SURGERIES

Maj. Pawan Kumar	Department of Anesthesia, GD Spl, MH- Allahabad
Lt. Col (Dr.) Sharma Vipin Jaishree*	Asst. Prof. (Department of Anesthesia), GMC, Azamgarh *Corresponding Author
Dr. Vijay Pratap Yadav	Asst. Prof. (Department of Anesthesia), GMC, Azamgarh
Dr. Satish Kumar	Prof. & HOD (Department of Anesthesia), GMC, Azamgarh

ABSTRACT

Introduction-: The present study was designed to compare the effect of two intrathecal α-2 agonists with bupivacaine in spinal anesthesia for urological procedures. Patients undergoing urological procedures under spinal anaesthesia are usually elderly having comorbid conditions. α-2 agonists is being used as an adjuvant in spinal anaesthesia with improved quality of anaesthesia and analgesia and minimal side effects. **Aims and objectives-:** The aim of this study is to compare the effects of intrathecal dexmedetomidine and clonidine as adjuvants to hyperbaric bupivacaine with respect to onset and duration of sensory and motor blockade duration of analgesia and incidence of side effects. **Materials and methods-:** This study was conducted in the Department of Anaesthesiology at a tertiary care hospital in Mumbai, from July 2014 to June 2016 with prior permission from the Institute Ethics Committee after fulfilling all the criteria. 90 patients (Age between 21-75 years, and weight 50 kg and above) undergoing various elective urological surgeriesunder subarachnoid blockin Department of Anaesthesiology and Critical Care were enrolled in the study. **Result-** The duration of anaesthesia was significantly longer (p-value < 0.05) in Group B (Mean 442.87, SD 48.31, SE 11.11) in comparison with Group A (Mean 261.11, SD 39.56, SE 7.78) and Group C (Mean 335.91, SSD 29.98, SE 9.93). Hence it's apparent that addition of Dexmedetomidine or Clonidine to Hyperbaric Bupivacaine significantly prolonged the duration of anaesthesia. **Conclusions:** α2-agonists with hyperbaric bupivacaine intrathecally have a faster onset of both motor and sensory block. It also prolongs the duration of analgesia.

KEYWORDS : Bupivacaine, dexmedetomidine, spinal anesthesia

INTRODUCTION-:

Spinal anaesthesia is the most commonly used technique for lower abdominal and lower limb surgeries. Spinal anaesthesia is associated with lesser intra-operative blood loss, lower patient morbidity and shorter hospital length of stay.[1,2] Spinal anaesthesia using local anaesthetics is associated with relatively short duration of action, and thus early analgesic intervention is needed in the postoperative period. Several local anaesthetics are used for spinal anaesthesia in Urological surgeries. Bupivacaine is a long acting amide local anaesthetic with a slow onset. Addition of an adjuvant to the local anaesthetic allows reduction in the amount of local anaesthetic required, thus reducing the incidence of side effects as well as prolonging the duration of anaesthesia.[3] The adjuvant drugs that are used commonly with local anaesthetics are alpha-2-agonists, vasoconstrictors, opioids, Midazolam ,N- methyl D-aspartate (NMDA) receptor antagonists etc.[4,5] Alpha 2 agonists, i.e. Clonidine and Dexmedetomidine act on the pre-junctional and post-junctional α2 receptors in the dorsal horn of the spinal cord. Clonidine, an alpha-2 agonist has already been tested as an intrathecal adjunctin a wide range of doses (15 to 225 g).[6] It has been found to prolong the duration of sensory and motor blockade by upto 60 minutes and also improvedthe quality of analgesia.[7] Sedation is a known side effect of spinal clonidine, occurring within first two hours and may last up to 8 hours. Dexmedetomidine is approximately 8-fold more α2-selective than clonidine.[8] Much smaller dose (3 μg) of dexmedetomidine can prolong motor and sensory block without hemodynamic compromise.[9]

MATERIALS AND METHODS –:

The present study was conducted in the Department of Anaesthesiology at a tertiary care hospital in Mumbai, over a period of twelve months from July 2014 to June 2016. During the stipulated period of time, 90 patients undergoing various elective urological surgeriesunder subarachnoid Department of Anaesthesiology and Critical Care were enrolled in the study. In this study, patient's Age was from 21 to 75 and weight was 50 kg and above. Before the day of surgery, all patients underwent pre-anaesthesia checkup and were assessed as per history and clinical examination. Routine and special investigations as per requirement were done. (Complete Haemogram, Urine, Chest X- Ray postero- anterior view, ECG and Special investigation were sought wherever indicated for any specific disorder of the patient. e.g.: Blood urea nitrogen (BUN), serum creatinine (S.Cr), serum sodium (Na), echocardiography and random blood sugar (RBS). Composition of drugs used in the three groups.

Group A- Received 12.5 mg of Hyperbaric Bupivacaine intrathecaly with 0.5 ml of preservative free normal saline to a total volume of 3ml.

Group B- Received12.5 mg of Hyperbaric Bupivacaine with 5 mcg Dexmedetomidine in 0.5 ml volume intrathecaly to a total volume of 3ml.

Group C- Received 12.5 mg of Hyperbaric Bupivacaine with 30 mcg Clonidine in 0.5 ml volume intrathecalyto a total volume of 3ml. After the completion of the surgery patient was shifted to post-operative recovery ward without prescribing any analgesics in any form, either from anaesthesia or surgical site. Patient was monitored till the complete recession of sensory as well as motor block was there and till the time patient did not demand analgesic or VAS Score ≥ 4. On reaching that point of time, study was stopped and patient was given systemic analgesicsinj. diclofenec sodium 75mg I.M. or as per individual requirement. Parameters recorded in the post-operative period were as follows:-

1- PR, SBP, DBP, MAP and RR were recorded at an interval of every 15 mins.
2- Motor block recovery (Modified Bromage Score of zero) was assessed every 15 min after completion of surgery till

the time of regression of two segments in maximum block in the post-anaesthetic care unit (PACU)

3- Sensory block regression was assessed every 15 min after completion of surgery till the time of regression of two segments in maximum block in the post anaesthetic care unit (PACU)

4- Motor Block was evaluated and recorded by MBS for lower extremity at an interval of every 15 minutes till complete return of motor power (MBS Score=0).

5- Time of first dose of post–operative systemic analgesic was on the basis of VAS score ≥ 4 or on demand made by the patient (whichever was early).

6- The duration of spinal anaesthesia for our study was defined as the period from spinal injection to the first occasion when the patient complained of pain in the postoperative period. All durations will be calculated considering the time of spinal injection as time zero.

Parameters noted were as follows: -

Time of onset of sensory blockade, Time of onset of motor blockade, Maximum sensory level, Maximum motor blockade, time of achieve that, Two-segment sensory regression time, Total duration of sensory blockade, and Vital parameters. Sensory blockade was achieved by testing the loss of pinprick sensation to 23-G hypodermic needle. Quality of analgesia was assessed by VAS.

- 0 – No pain
- 1–3 – Mild pain
- 4–6 – Moderate pain
- 7–10 – Severe pain.
- Motor blockade was assessed using modified Bromage scale.
- 0 – Full flexion of knee and feet
- 1 – Inability to raise extended leg, able to move knee and feet
- 2 – Inability to raise extended leg and move knee, able to move feet
- 3 – Complete block of lower limb.
- Sedation was assessed by Ramsay sedation scale.
- 1. Patient anxious, agitated, or restless
- 2. Patient-cooperative, oriented, and tranquil alert
- 3. Patient responds to commands
- 4. Asleep but with brisk response to light glabellar tap or loud auditory stimulus
- 5. Asleep, sluggish response to light glabellar tap or loud auditory stimulus
- 6. Asleep, no response to light glabellar tap or loud auditory stimulus.

Vitals included HR, mean arterial pressure (MAP), and SPO2 recorded at 0, 2, 5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, and 90 min.

RESULTS-:

Table 1- Comparison of onset of sensory block in study subjects.

One set of Sensory Block	Mean	SD	SE	P -value
A	4.58	1.20	0.49	0.614
B	5.15	1.79	0.37	0.614
C	5.42	1.64	0.47	0.614

Out of the total 90 patients, the Onset of sensory block took 4.58, 5.15 and 5.42 minutes in group A, B and C. The difference was statistically non-significant. (Table 1)

Table 2- Comparison of onset of motor block in study subjects

One set of Motor Block	Mean	SD	SE	P -value
A	5.67	1.47	0.60	0.421
B	6.24	1.85	0.39	0.421
C	6.83	1.90	0.55	0.421

Table 2 shows that Onset of motor block took 5.67, 6.24 and 6.83 minutes respectively in group A,B and C. The difference was statistically non-significant.

Table 3- Comparison of total duration of motor block in study subjects

Duration of Motor block Recovery	Mean	SD	SE	p- value
A	191.17	11.74	4.79	<0.05 (B vs. Clo; B vs A and Clo vs A)
B	374.09	63.61	13.26	
C	263.33	33.71	9.73	

This (table 3) shows that out of the total 90 patients, the total duration of motor block recovery were 191.17, 374.09 and 263.33in group A, B and C respectively. The difference was statistically significant.

Table 4- Rescue analgesic agent requirement in study subject

Drugs	A	C	p- value
Fentanyl(mcg)	22.14	12.34	<0.001
Midazolam(mg)	2.24	118	<0.001

In this table, Group A subjects required higher doses of rescue analgesics (Inj. Fentanyl 22.14 mcg and inj. Midazolam 2.24 mg) i.v. compared to Group C (Inj. Fentanyl 12.34 mcg and inj. Midazolam 1.18 mg iv), while Group B did not require any analgesic agents.

Table 5-: Comparison of Intra-op Complication in study subjects

Intra-/Post-op Complications	Group			Total	p- value
	A	B	C		
Hypotension	2	3	3	8	0.2
	6.7%	10.0%	10.0%	8.9%	
Nausea/Vomiting	5	3	4	12	0.074
	16.7%	10.0%	13.3%	13.3%	

The above table shows out of 90 patients, a total of 08 (8.89%) patients developed hypotension after the subarachnoid block (Group A 02, Group B 03, Group C 03). They were resuscitated with intravenous crystalloid. 12 (13.3%) patient had nausea/vomiting, managed with Ondansetron 4 mg intravenously (Group A 05, Group B 03, Group C 04). No other complication in the intra-operative period was observed in any other patients.

Table 6: Intra-operative DeKock sedation score for study subjects

Sedation score	No. of patients		
	Group A	Group B	Group C
1	0	3	2
2	0	0	0
3	0	0	0

The above table shows total three(10%) patient out of 30 in Group B had De kock sedation score 1 Intra-operatively. While group C show only two (6.67%) had De Kock sedation score 1 and no patient have sedation score in Group A.

DISCUSSION-:

Spinal anesthesia is the most suitable, cost effective and simple modality of anesthesia for lower abdominal surgeries. Some important advantages of this technique are good muscle relaxation, patient co-operation, early ambulation and hence shorter hospital stay. However subarachnoid block is limited by relatively short duration of action and therefore cannot provide postoperative pain relief for a long period. Other side effects include hypotension headache and bradycardia. This prospective observational study was carried out in the Department of Anaesthesiology at a tertiary

care hospital in Mumbai. Ninety patients undergoing urological surgeries were included in the study. The patients were randomly divided into 3 groups of 30 each: Group A: Bupivacaine (H) + Normal saline, Group B: Bupivacaine (H) + Dexmedetomidine Group C: Bupivacaine (H) +Clonidine. Experimental studies have shown that opioids and alpha-2 adrenergic agonist administered spinally are able to relieve visceral pain.[10] In our study, the total duration of analgesia was significantly greater in dexmedetomidine group (442.87 min) than in Clonidine (335.91) or normal saline group (261.11min). The difference was statistically as well as clinically significant. Study done by Mahendru et al. for lower limb surgeries total duration of anaesthesia was significantly longer in dexmedetomidine group (295.5 min) than other three groups. Least duration was found in normal saline group (183 min) while in clonidine group (242.3 min) and fentanyl (235.5 min) group which is clinically and statistically significant ($p<.05$).[11] In our study, the mean post-operative VAS score for the first 6 hours were lowest in Group B (1.365) and highest in Group A (3.745) while in group C was 2.405. There was a significant difference in the VAS scores of the three groups at the third, fourth and fifth hour (p-value < 0.001). Group A subjects required higher mean doses of rescue analgesia and sedation compared to others 2 groups. Group A required Inj. Fentanyl 22.14 mcg and inj. Midazolam 2.24 mgi.v.compared to Group C required Inj. Fentanyl 12.34 mcg and inj. Midazolam 1.18 mg iv, while Group B did not require any analgesia and sedation agents. In Mahendru et al. study found that VAS score and total requirement of analgesic were least in dexmedetomidine group and maximum in normal saline group among all four groups for undergoing lower limb surgeries.[11] In our study, observations were also made for intra-operative side effects and complications like hypotension, bradycardia, shivering, headache, nausea and vomiting etc. Hypotension had occurred in only 8 (8.9%) patients, of which, two were from group A and three each were from group B and group C. Twelve (13.33%) patients complained of nausea and vomiting in the post-operative period. No other complication in the intra-operative period was observed in any other patients.

CONCLUSION-:

In present study we conclude that both 5 mcg dexmedetomidine and 30 mcg clonidine can be used as adjuvant to hyperbaric bupivacaine in subarachnoid block as significantly prolongs the Sensory block, Motor block, Analgesia and less requirement of sedation and rescue analgesia compared to clonidine or without adjuvant. Both drugs had minimal complication rate and the patients remained thermodynamically stable during intra and post-op period. This can be of benefit to patients undergoing any lower extremity surgery. However, further multi-centric studies with larger sample size needs to be done to further strengthen our findings.

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