Original Article

Comparison of effects of hyperbaric bupivacaine with or without dexmedetomidine use in subarachnoid block

Nitinkumar Ingle[1*], Vaibhav Mahankale[2], Deepak Kokane[3], Satish G Deshpande[4]

[1]SMO, LTMMC, Sion, Mumbai, Maharashtra, INDIA.
[2]JR III, [3]Associate Professor, [4]Professor and HOD, Department of Anaesthesia, Government Medical College, Latur, Maharashtra, INDIA.
Email: nbi188@gmail.com

Abstract

Background: The primary aim of intrathecal local anaesthetic is to provide adequate sensory and motor block necessary for all below umbilical surgeries. A number of adjuvants, such as clonidine, midazolam and others have been studied to prolong the effect of spinal anaesthesia. Dexmedetomidine, a substance that has been used for sedation and analgesia in veterinary medicine for many years is under evaluation as a neuraxial adjuvant. **Aim and Objectives:** To study Effects of use of hyperbaric Bupivacaine with or without Dexmedetomidine for subarachnoid block in relation to various anaesthetic parameters **Material and Methods:** It was prospective, randomized, double blind study conducted at tertiary care centre over a period extending from January 2014 to October 2015. The study included a total of 100 patients divided into two groups (each of 50 patients) i.e. control and study groups depending upon drugs administered. **Results:** The regression of sensory block was slower and onset of motor block is quicker in patients those who received intrathecaldexmedetomidine. There was a significantly prolonged duration of sensory analgesia also, theonset as well as time for attaining maximum sensory level was significantly faster in study group. **Summary and Conclusions:** Subarachnoid block using 0.5% hyperbaric Bupivacaine (15mg) with dexmedetomidine (5mcg) leads to significantly quicker onset and prolonged duration of action of Motor and Sensory block also a minimal intraoperative and postoperative complication as compared to 0.5% hyperbaric bupivacaine.

Key Words: analgesia, Spinal anesthesia.

[*]**Address for Correspondence:**
Dr. Nitinkumar Ingle, SMO, LTMMC, Sion, Mumbai, Maharashtra, INDIA.
Email: nbi188@gmail.com
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INTRODUCTION

Spinal anaesthesia is preferred over general anaesthesia, particularly in surgical procedures of lower abdomen and lower limbs since the introduction of spinal anaesthesia in 1898 by Dr. August Bier, who described the intrathecal administration of cocaine. [1]The main reasons for extensive use of spinal anaesthesia in general are simplicity of equipments, low cost, profound analgesia, less blood loss and less metabolic alterations. The aim of intrathecal local anaesthetic is to provide adequate sensory and motor block necessary for all below umbilical surgeries. Hyperbaric bupivacaine is the most commonly used intrathecal local anaesthetic. A common problem during lower abdominal surgeries under spinal anaesthesia is visceral pain, nausea, and vomiting.[2] Various adjuvants have been added to bupivacaine to shorten the onset of block and prolong the duration of block. A number of adjuvants, such as clonidine, midazolam and others have been studied to prolong the effect of spinal anaesthesia[3]. Clonidine has side effect like bradycardia, hypotension, mouth dryness, nausea, respiratory depression, itching, neurological toxicity while, the addition of opioids to local anaesthetic solution has disadvantages such as pruritus and respiratory depression.[4] Dexmedetomidine, is developed by Orion pharma[5]and it is recently being introduced in Indian

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market. It's a new highly selective α_2-agonist and is the S-enantiomer of medetomidine,a substance that has been used for sedation and analgesia in veterinary medicine for many years is under evaluation as a neuraxial adjuvant as it provides stable hemodynamic conditions, good quality of intraoperative and prolonged postoperative analgesia with minimal side effects.[6]

MATERIAL AND METHODS

Its a prospective, randomized, double blind study carried out to evaluate the efficacy of dexmedetomidine as an adjuvant to intrathecal 0.5% Bupivacaine heavy for below umbilical surgeries. The present study was conducted at tertiary care centre over a period extending from January 2014 to October 2015. It was conducted after approval from institutional ethics committee and written, valid, informed consent of all the patients. The study included a total 100 patients belonging to ASA grade I and II of either sex with age between 15-45 years posted for elective below umbilical surgery. Patients those who consented for study were taken in operation theatre and procedure of spinal anaesthesia explained to the patient. The total volume injected through successful lumbar puncture was 3.5 ml in both the groups. Patients were divided into two groups (each of 50 patients) i.e. control group (Group B) and study group (Group BD) depending upon drugs used.

	Groups	
	Group B (Control Group)	Group BD (Study Group)
Drugs used for anaesthesia	inj. Bupivacaine 0.5 % (heavy) 15 mg(3cc) + Normal saline 0.5 cc	inj. Bupivacaine 0.5 % (heavy) 15 mg(3cc) + inj. dexmedetomidine (5mcg) 0.5cc

The patients excluded from the study consisting of those who refused for spinal anaesthesia, patients with severe cardiovascular, respiratory, central nervous system disorders, vertebral column abnormalities, extremes of age, etc., cases having h/o allergy for Bupivacaine and dexmedetomidine, any contraindication for regional anaesthesia and those with ASA grade III or IV. Pulse rate, systolic and diastolic blood pressure, respiratory rate and SpO_2 were monitored intraoperatively and in postoperative period for 9 hours after spinal anaesthesia. Other parameters observed i.e. sensory and motor block parameters, analgesia time and VAS score and subjected to statistical analysis. Sensory blockade was assessed using a short bevelled 22 gauge needle and was tested in the mid clavicular line on chest, trunk and legs on either side while, motor blockade was assessed by straight leg raising while lying supine and was graded according to Modified Bromage Scale.[7] The results of the study were statistically analyzed between the 2 groups using unpaired t-test except for results of complications where Chi square test was used.

RESULTS AND OBSERVATIONS

In the present study, A total of 100 patients belonging to ASA grade I and grade II posted for below umbilical surgeries were randomly selected. The patients were divided into 2 groups of 50 each. Among Group B, there were 39 male and 11 female, while in Group BD, there were 29 male and 21 were female (Table No. 01).

Table 1: Gender Wise Distribution of patients

Gender	Number of patients		Chi Square Test	P value
	Group B	Group BD		
Male	39	29	2.71	>0.05
Female	11	21		
Total	50	50		

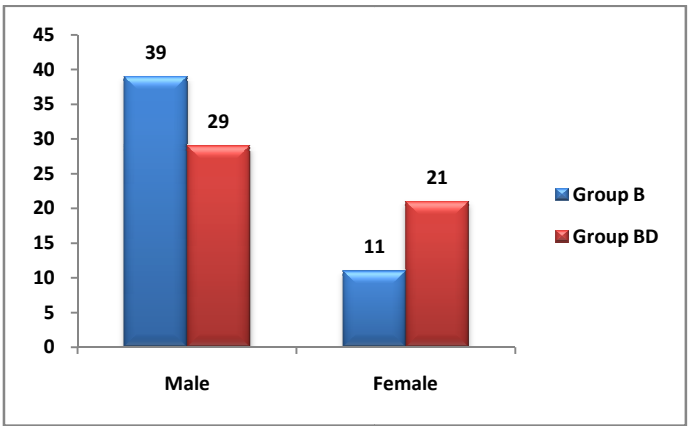

Figure 1: Gender Wise Distribution of patients

Sex wise distribution was statistically compared using Chi square test and was found non-significant between the two group, i.e. p value > 0.05.

Table 2: Patients Characteristics among Two Groups

	Group B		Group BD		P Value
	Mean	SD	Mean	SD	
Age	34	±8.7	32.9	±8	>0.05
Height	154.2	±15.04	153.23	±14.31	>0.05
Weight	55.04	±8.80	54.02	±8.22	>0.05

From Table No 02, among Group B mean age of patient was 34±8.7 years. The mean height was 154.2±15.04 cm and the mean weight was55.04±8.80 kg. Highest age was 48 years and lowest age was 19 years, highest height was 189 cm and lowest was 126 cm, highest weight was 78 kg and lowest weight was 44 kg. In Group BD mean age of patient was 32.9±8.00 years. The mean height was153.23±14.31 cm and the mean weight was 54.02±8.22 kg. Highest age was 45 years and lowest age was 18 years, highest height was 189 cm and lowest was

127 cm, highest weight was 72 kg and lowest weight was 44 kg. The present study was undertaken to evaluate the effect of addition of dexmedetomidine in subarachnoid block along with 0.5% Bupivacaine (H) on sensory, motor, hemodynamic and other analgesic parameters both intraoperatively and postoperatively.

Table 3: Variation of various anaesthetic parameters among two study groups

Anaesthetic Parameters (in minutes)	Group B		Group BD		P value
	Mean	Standard Deviation	Mean	Standard Deviation	
Onset of Sensory Block	4.32	±0.61	2.47	±0.29	<0.05; Significant
Time for Maximum Sensory Level	7.51	±0.27	5.39	±0.31	<0.05; Significant
Duration of Sensory Block	90.21	±6.09	139.86	±6.18	<0.001; Highly significant
Onset of Motors block	5.87	±0.29	3.53	±0.27	<0.05; Significant
Duration of Motor Block	164.32	±3.45	227.1	±1.76	<0.001; Highly significant
Duration of Analgesia	222.54	±14.68	368.74	±11.72	<0.001; Highly significant
Duration of Surgery	115.3	±11.34	118.43	±12.67	>0.05; Not significant

From Table No. 03 below, theonset of sensory block as well as time for attaining maximum sensory level was significantly faster ($p < 0.05$) in study group as compared to control group. Also, its clear that regression of sensory block was slower and onset of motor block is quicker in patients those who received intrathecaldexmedetomidine. There was significant prolonged duration of sensory analgesia in dexmedetomidine group i.e. in Group BD as compared to control group ($p<0.001$). In our study, intraoperative andpostoperative complications observed were inadequate level of analgesia, bradycardia, tachycardia, hypotension, high level of block. We found that there was no statistically significant difference of intraoperative and postoperative complications between both the groups as the p value > 0.05.

DISCUSSION

Dexmedetomidine hydrochloride, a newer agent within the class of α_2 adrenoreceptor agonist delivers clinically effective sedation with analgesic property for use in intensive care unit setting. Additionally, it has an ability to eliminate or reduce the need for other analgesic medications. It was introduced in clinical practice in the United States in 1999 and approved by the FDA only as a short-term (<24 hours) sedative for mechanically ventilated adult ICU patients.[8] The dose of dexmedetomidine used in subarachnoid block ranged 3-5 µg in various studies showing effective clinical and safety profile. Hence, in this study, we used 5 µg preservative free dexmedetomidine with 15 mg of hyperbaric bupivacaine intrathecally in Group BD. The demographic data such as age, sex, height and weight being comparable has no influence on outcome of the study. In present study mean time for onset of sensory block was 2.47±0.29 min in Group BD, which was quicker as compared to 4.32±0.61 min in GroupB. Onset sensory block was significantly faster ($p < 0.05$) in study group ascompared to control group. The findings of this study are similar to other studies i.e. quicker onset of sensory block in patients of dexmedetomidine group comparable with R.Brinda *et al*[9], Memon N *et al*[10], Chatrath V *et al*[11]. Our findings were contradictory to study conducted by Feroz Ahmad Dar *et al*[12] and Sangeeta Agarwal Bansal *et al*[13] who had found no difference in time of onset using 5 µg dexmedetomidine. In our study time to achieve maximum sensory block was 5.39±0.31min in Group BD as compared to 7.51±0.27min in Group B. Time to achieve maximum sensory block was significantly lower (p value<0.05) in dexmedetomidine group as compared with control group. It indicates cephalad spread of sensory block occur faster when dexmedetomidine was added to intrathecal Bupivacaine. This finding was similar to that of study carried out by R. Brinda *et al*[9] while, it was contradictory to findings of Sangeeta Agarwal Bansal *et al*[13]andFeroz Ahmad Dar*et al*[12], Hala E A Eid *et al*[14] who found no such difference regarding timeto achieve maximum sensory block. About motor block parameters, mean time of onset of motor block was significantly quicker ($p<0.001$) i.e. 3.53±0.27 min in Group BD as compared with 5.87±0.29 min in Group B. It was comparable to study carried out by R. Brinda *et al*[9] Who found mean time of onset of motor block 2.30±0.45 min in dexmedetomidine group(5mcg) as compared to 6.57±0.49 min in control group. Regarding mean duration of motor blockade in Group BD i.e. dexmedetomidine group was 227.1±1.76 min which was significantly prolonged ($p<0.001$) as compared with Group B. It wascomparable with study carried out by Chatrath V*et al*[11]who found that the mean duration of motor blockade

was 318.36±9.374 min in dexmedetomidine group as compared to only 146.94±9.713 min in control group ($p<0.05$). Similar results were also obtained by Sunil B.V. *et al*[15] After analyzing the data collected by using chi-square test, there was no statistically significant difference of intraoperative and postoperative complications between both the groups as the p value > 0.05. Results of our study are similar with the studies carried out by Sunil B.V. *et al*[15], Chatrath V *et al*[11], MemonN*et al*[10], R. Brinda *et al*[9]in respect of onset of sensory block, onset of motor block, duration of sensory block, duration of motor block, duration of analgesia, intraoperative and postoperative complication.

SUMMARY AND CONCLUSIONS

The demographic data such as age, sex, height and weight were comparable in both groups and has no influence on outcome of the study. Use of0.5% hyperbaric Bupivacaine (15mg) with dexmedetomidine(5mcg) in subarachnoid block

1. Leads to significantly quicker onset of Motor and Sensory block as compared to 0.5% hyperbaric Bupivacaine.
2. Leads to prolonged duration of Motor and Sensory block also analgesia as compared to 0.5% hyperbaric Bupivacaine.
3. Leads to minimal intraoperative and postoperative complication as compared to 0.5% hyperbaric Bupivacaine.
4. Leads to favourable hemodynamic stability without any significant side effects making patients more comfortable in postoperative period.

Also, it's useful in subarachnoid block for below umbilical surgeries where prompt onset and prolonged duration of post-operative analgesia is needed.

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