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Original Research Paper

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COMPARISON OF INTRATHECAL DEXMEDETOMIDINE VERSUS BUPRENORPHINE AS ADJUVANT TO BUPIVACAINE IN SPINAL ANAESTHESIA FOR ABDOMINAL HYSTERECTOMY

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ABSTRACT

Background: The supplementation of local anaesthetics with adjuvants to improve the efficacy of subarachnoid block has been recognized since long. The most preferred drug has been opioids, but newer drugs like dexmeditomidine has also been introduced and investigated as an effective adjuvant.

Aim: This study was conducted to evaluate and compare the characteristics of subarachnoid blockade, hemodynamic stability and adverse effects of Intrathecal buprenorphine and intrathecal dexmeditomidine as an adjuvant to 0.5% hyperbaric bupivacaine for abdominal hysterectomy.

Materials and Methods: The present study included 80 patients aged between 35- 60 years of ASA Physical Status PS I/II scheduled for elective abdominal hysterectomy surgeries. The patients were randomly allotted to two groups to receive intra thecal 3ml of 0.5% bupivacaine with 60µg of buprenorphine (Group B; n=40) or 3ml of 0.5% bupivacaine with 5µg of dexmeditomidine (Group D; n=40). The onset time to peak sensory level, motor block, sedation, hemodynamic variables, duration of motor block, analgesia and any adverse effects were noted

Results: The motor, sensory blockade and time of rescue analgesia were significantly prolonged in dexmeditomidine group (GroupD), compared to buprenorphine group (Group B). The sedation level was higher in Group D compared to Group B. There was no significant difference in hemodynamic variables, and side effect profile

Conclusion: Intrathecal dexmeditomidine when compared to intrathecal buprenorphine causes prolonged anaesthesia and analgesia with reduced need for sedation and rescue analgesics.

KEYWORDS : dexmeditomidine, bupivacaine, buprenorphine; spinal anaesthesia

INTRODUCTI0N

Spinal anaesthesia is most commonly used for surgeries of known duration that involve lower extremities, perineum pelvis and lower abdominal organs. The advantages of subarachnoid block are limited by its short duration of action and side effects such as hypotension and bradrycardia resulting due to sympathetic blockade.1.Nowadays it is a common practice to supplement adjuncts along with local anaesthetics to decrease the dose of local anaesthetic, provide better analgesia postoperatively. It is techniquely easy to administer, less expensive and safe.

Over the years, many drugs have been tried for this purpose. . The drugs include morphine buprenorphine, fentanyl, ketamine, midazolam, magnesium sulphate, neostigmine, clonidine and dexmeditomidine. (2) Opioids have been used for many years along with local anaesthetics. (3). Buprenorphine is a centrally acting lipid soluble analogue of the alkaloid thebaine. It shows analgesic property both at spinal and supra spinal levels. (4) It has been used for various surgeries at different doses for a few decades. It has been consistently proven to prolong the duration of anaesthesia. (5)(6)

Dexmeditomidine also is found to increase the quality of subarachnoid block produced by bupivacaine. Dexmeditomidine is a specific α-2 adrenergic agonist. (7). It also has been studied as a primary sedative in infants following open heart surgery.(8) It was first used as an additive along with local anaesthetics in humans for trans urethral resection of prostate. It has found to prolong both sensory and motor block and has anti nociceptive action for both visceral and somatic pain. It is being evaluated as a potential adjuvant to local anaesthetics. Other adjuvants like clonidine, neostigmine and fentanyl have been compared with dexmeditomidine along with bupivacaine in many other studies with good results for dexmeditomidine. (9) (10). Even magnesium sulphate has been studied as an adjuvant to spinal bupivacaine. (11) Present study is to compare the subarachnoid block characteristics and side effect profile of these two drugs in patients receiving subarachnoid block for abdominal hysterectomy.

We couldn't find much literature comparing the effects of buprenorphine and dexmeditomidine as adjuvant to bupivacaine in spinal anaesthesia for abdominal hysterectomy. Hence this study was undertaken to compare the effects of buprenorphine and dexmeditomidine as adjuvant to hyperbaric bupivacaine for efficacy, hemodynamic stability, post operative analgesia and side effects.

OBJECTIVES

To compare the efficacy of Intrathecal dexmeditomidine versus buprenorphine as adjuvant to bupivacaine in spinal anaesthesia in abdominal hysterectomy in terms of onset and duration of sensory and motor block, hemodynamic stability and side effect profile.

METHODOLOGY

Study setting: This was a prospective observational cohort study conducted in 80 patients of ASA physical status 1 and 2 and aged between 45-65 undergoing elective abdominal hysterectomy in a tertiary care centre after obtaining institutional ethical committee clearance. They were assessed for inclusion criteria and included in the study after obtaining written informed consent.

Sample size: A total of 80 patients were selected, divided into two groups of 40 each. Group B received buprenorphine 60 µg and group D received dexmeditomidine 5 µg as adjuvant to 15 mg of bupivacaine 0.5% heavy respectively.

Inclusion criteria:

1. Age 45-65 yrs and height not less than 150 cm.
2. American Society of Anaesthesiologists (ASA) physical status I and II.
3. Elective abdominal hysterectomy.

Exclusion criteria:

1. Bleeding disorders
2. On anticoagulant therapy.
3. Cardiac diseases.
4. On Beta blocker/α antagonist therapy.
5. Infection at puncture site.
6. allergy to local anaesthetics

Equipments:

1. 23 G quinke spinal needle.
2. Inj .Bupivacaine hydrochloride 0.5% heavy 4 ml ampoule

3. Inj dexmeditomidine 1ml ampoule
4. Inj Buprenorphine 1 ml ampoule
5. Emergency drugs.
6. Syringes 2cc ,5 cc and needles

MATERIALS AND METHODS

A routine preanaesthetic evaluation was done in patients and necessary investigations were done. Overnight fasting of 8 hrs was ordered for all patients and premedicated with Tab.Alprazolam 0.25mg orally on the night before surgery, Tab. Ranitidine 150mg and Tab.Metaclopromide 10mg on morning of surgery. In the operating room an intravenous access with 18G cannula under LA was obtained and were preloaded with 15ml/kg of 0.9% Normal saline over 15-20 minutes. Monitors like non-invasive blood pressure, pulse oximeter, electrocardiograms were attached and baseline systolic and diastolic blood pressure, heart rate and oxygen saturation were recorded. 100% O2 through face mask at 4l/mt was started and positioned for spinal anaesthesia.

Subarachnoid block (SAB) was performed under asepsis and local anaesthesia using 23G Quinke-Babcock spinal needle at L3-L4 interspace in lateral position. After ensuring clear and free flow of cerebrospinal fluid (CSF) loaded drug was injected slowly over 10-15 seconds. Group D Patients were given 5µg of dexmeditomidine as adjuvant to 3ml of 0.5% heavy bupivacaine. Group B patients received 60 µg of buprenorphine with 3ml of 0.5% heavy bupivacaine. The drug solution was prepared by an anaesthesiologist not included in the study .The time at which injection is completed was taken as time zero and from that point all measurements were recorded. After sub arachnoid block patients were made to lie supine. Sensory testing was tested using 26G hypodermic needle at midclavicular line and the time taken to reach T6 level dermatome and maximum sensory level (Lmax) attained noted.

Motor levels were assesses using modified Bromage scale and sediation assessed by Ramsay sedation scale. Intraoperatively patients were monitored with, non invasive blood pressure , heart rate, electrocardiogeram and arterial Oxygen saturation (spo2) continuously.

Heart rate less than 60/minutes was taken as brady cardia and treated with Inj atropine 0.6mg. Mean arterial blood pressure <60 mmHg was regarded as hypotension, and was treated with intra venous fluid and vasopressors (ephedrine 6 mg). Monitoring was continued in the postoperative period until complete recovery from spinal anaesthesia. Duration of analgesia measured as time taken for first rescue analgesia from the completion of spinal injection (zero time). Incidence of nausea and vomiting and shivering were recorded and managed accordingly. Rescue analgesia was provided with Inj diclofenac sodium 50 mg i/v after test dose.

PARAMETERS STUDIED:

1. Time taken to reach a sensory block of (T6).
2. Maximum sensory level attained (Lmax).
3. Ramsay sedation score at various intervals.
4. Modified Bromage scale for motor block
5. Duration of analgesia (time taken for first rescue analgesic).
6. Incidence of side effects like bradycardia, hypotension, nausea, vomiting and shivering.

Table No.1 Ramsay sedation scale

Score	Responsiveness
1	Anxious, agitated, restless.
2	Cooperative, oriented, tranquil.
3	Responds to commands only.
4	Asleep, 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 painful stimuli.

Table No.3 Modified bromage scale

0	No motor blockade
1	Can flex knee, move foot but cannot raise leg
2	Can move foot only
3	Can not move foot or knee

STATISTICAL ANALYSIS:

Quantitative variables were summarised as mean and standard deviation (SD) and qualitative variables were summarised as frequency and percentages. Quantitative variables were compared between the two group using students t test (or using Mann Whitney u test if the data was not normally distributed). Qualitative variables were compared between the two group using chi square tests. A p value of 0.05 or less was considered as statistically significant. All analysis was carried out by SPSS version 17 (SPSS Inc, IL, USA).

Sample size – A study by Kumar et all showed that the standard deviation of mean motor blockade was 21 minute. To detect an average difference of 10 minutes between the two groups with 5% alpha error and 80% power the sample size required was 40 subjects.

RESULTS

The groups were comparable with respect to the demographic characteristics like age, body weight, height, body mass index.

Table No.3 Demographic Data

Variables	Group B Mean (SD)	Group D Mean (SD)	P values
Weight in Kg	53.8 (4.7)	54.8 (5.8)	0.40
Height in cm	155.1 (4.2)	154.8 (3.2)	0.79
BMI in kg/m2	22.4 (1.6)	22.5 (1.8)	0.74

Patients in both groups were comparable in terms of demographic variables. Mean age of dexmeditomidine group (group D) was 44.80 ± 5.195 and buprenorphine group (group B) was 45.78 ± 5.385. Mean weight of group D was 54.83 ± 5.80 compared to 53.83 ± 4.72 in the B group. Mean height in the D group was 154.82 ± 3.19 compared 155.05 ± 4.20 in the B group. The mean BMI in group D was 22.51± 1.75 compared to 22.38 ± 1.60 in group B.

The two groups were also comparable with respect to the American society of anaesthesiologists' physical status classification.

Table No. 4 ASA Classification

	ASA.1	ASA.2	Total
Category B	25	15	40
Category D	26	14	40
Total	51	29	80

The p value of this comparison was 1.00 and hence the groups showed no statistically significant difference in A S A physical status classification

Table No. 5 Assessed parameters

Variables	Group B Mean (SD)	Group D Mean (SD)	P values
Onset of sensory block sec	138.0 (29.3)	174.8 (29.8)	<0.001
Time required to reach a Bromage score of 0 sec	137.6 (28.8)	172.1 (28.5)	<0.001
Duration of Analgesia mts	397.9 (77.5)	522.1 (39.5)	<0.001

Onset of sensory and motor blockade was faster in dexmedit omidine group. It was 138±29.260 and 137 ± 28.801 compared to 174.75 ± 29.806 and 172 ± 28.507 in the buprenorphine group, which was found to be statistically significant with p-value of [.oo].

The mean duration of analgesia in buprenorphine group was 397.88 minutes and the standard deviation was 77.53 compared to the duration of 522.13 minutes and standard deviation of 39.514 in dexmeditomidine group which was statistically significant with a p value of [0.00].

Table No.6 Maximum sensory level attained

		Lmax		
	T4	T5	T6	
Category B	18	12	10	40
Category D	21	14	5	40
Total				80

21 patients in group D attained maximum of T4 compared to 18 patients in group B which was not statistically significant and hence it is concluded that both groups were comparable with respect to the highest level achieved.

Table No 7. Sedation Score Analysis

Time	RSS score in Group B			RSS score in Group D			P value
	1	2	3	1	2	3	
5 min	14 (35.0)	23 (57.5)	3 (7.5)	7 (17.5)	32 (80.0)	1 (2.5)	0.09
10 min	1 (2.5)	23 (57.5)	16 (40.0)	0 (0)	32 (80.0)	8 (20.0)	0.77
30 min	11 (27.5)	19 (47.5)	10 (25.0)	19 (47.5)	17 (42.5)	4 (10.0)	0.09
60 min	14 (35.0)	15 (37.5)	11 (27.5)	31 (77.5)	9 (22.5)	0 (0)	<0.00 1
120 min	0 (0)	16 (40.0)	24 (60.0)	0 (0)	38 (95.0)	2 (5.0)	<0.00 1
180 min0	0 (0)	39 (97.5)	1 (2.5)	1 (2.5)	39 (97.5)	0 (0)	0.37

Ramsay sedation score at 5 minutes

The p value for this comparison was 0.09 and hence it concluded that there was no significant difference between the two groups in sedation score at 5 minutes.

Ramsay sedation score at 10 minutes

The p value for sedation score at 10 minutes was 0.77 and hence it is concluded that there was no significant difference between the two groups.

Ramsay sedation score at 30 minutes

The p value was 0.090 and hence it is concluded that there is no significant difference between the two groups in Ramsay sedation score at 30 minutes

Ramsay sedation score at 60 minutes

The p value was < 0.001 and hence it is concluded that there was significant difference between the sedation scores at 60 minutes between the two groups

Ramsay sedation score at 120 minutes:

The p value was 0.00 and hence it is concluded that there is significant difference between the two groups.

Ramsay sedation score at 180 minutes:

The p value for sedation score at 180 minutes was 0.368 and hence it is concluded that there is no significant difference between the two groups.

Incidence of side effects:

Table No.8 Incidence of side effects

	Group B	Group D	p-value
Nausea /vomiting	5	3	
Shivering	4	2	0.751
Atropine required	2	1	
Hypotension	14	17	

Incidence of side effects were comparable in both groups and they were found to be statistically not significant .

DISCUSSION

Regional anaesthesia and analgesia have the potential to provide excellent operating onditions and prolonged postoperative pain relief. But postoperative pain control is a major problem with subarachnoid block and early supplementation of analgesics is required. To avoid this, various adjuvants have been tried but are associated with side effects. Hence intrathecal α-2 agonists like Clonidine and intra thecal alpha 2 adrenergic agonists are used as adjuvants to local anaesthetics to potentiate the effects of local anaesthetics and allow a decrease in the required dose without causing respiratory depression. Intrathecal α-2 adrenergic agonists have antinociceptive action for both somatic and visceral pain. (13) Addition of adjuvants to the local anaesthetic bupivacaine helps to reduce the dose of bupivacaine, prolongs the duration of analgesia and provides hemodynamic stability with fewer side effects. Many studies have proved it as the one done by Kanazi et al. (14) who used low dose dexmeditomidine along with bupivacaine in patients posted for TURP. In our study also we used reduced dose of bupivacaine and had prolonged analgesia due to the addition of low dosedexmeditomidine. Support for this comes from the studies done by Priyanka Bansal et al (15) and Susruth et al (16)

Bansal and ML khatri et al studied the effects of two different doses that is 5µg and 10µg of dexmeditomidine along with bupivacaine for lower abdominal surgeries, and they found that 10µg group had a faster onset of action than buprenorphine 60µg and fentanyl 10µg as adjuvant to spinal anaesthesia. (17). This study also emphasizes using better adjuvants along with bupivacaine which we have done in our study by using dexmeditomidine.

We have been using buprenorphine and dexmeditomidine as adjuvants to bupivacaine hydrochloride in our hospital. Only few studies have been reported comparing these two drugs along with bupivacaine for abdominal hysterectomies. We have compared buprenorphine and low dose dexmeditomidine in our study.

Onset of sensory and motor blockade was faster in dexmed itomidine group and was statistically significant. This is in concordance with the studies done by Shukla et al.(18) Patients in group D attained maximum of T4 level compared to 18 patients in group B which was not statistically significant and hence it is concluded that both groups were comparable with respect to the highest level achieved. The duration of analgesia was prolonged in the dexmed group 522 mts than the buprenorphine group 397 mts and was found to be statistically significant as was with the studies by Shah et al, 474 mts for 5microgram dexmeditomidine. (19)

Ramsay sedation score at various intervals were noted. Patients in group D showed statistically significant more sedation at 120 and 180 minutes. Sedation score at other intervals were comparable in both groups. The side effects noted during the study were nausea, vomiting, bradrycardia and shivering which were treated appropriately with drugs like ondansetron, and atropine. Both these drugs were comparable with incidence of side effects.

Our study is found to be correlating with many of the existing literatures. Mahima Gupta et al studied the subarachnoid characteristics of buprenorphine and dexmeditomidine as spinal adjuvant to bupivacaine in elective lower abdominal surgeries. They observed no significant difference in time taken for onset of sensory and motor blockade. But our study showed statistically significant difference in time taken for onset of sensory and motor blockade, dexmeditomidine group had faster onset. They also observed that the group which received dexmeditomidine showed statistically significant high sedation scores, but our study observed the Ramsay sedation score was more in dexmeditomidine group only at 60 minutes and 120 minutes. The duration of analgesia in dexmeditomidinegroup was 522 minutes and 398 minutes in buprenorphine group, which was statistically significant. This

result also supports the findings of study of Mahima Gupta et al. (20). There were no significant side effects noted in both groups which are also supported by our study.

Study by Al Ghanem et al compared dexmeditomidine versus fentanyl with Intrathecal bupivacaine and found out that addition of dexmeditomidine definitely prolongs the analgesia with minimal side effects .(21) Our study has also proved this fact.

Similar studies are required to compare the effects of these drugs in other patient groups. Dexmed associated anaesthesia has a prolonged motor blockade which doesn't make it suitable for day care surgery.

CONCLUSION

In our study, bupivacaine along with Intrathecal dexmeditomidine when compared to Intrathecal buprenorphine caused early onset of sensory anaesthesia with prolonged duration of anaesthesia which could be beneficial in long duration surgeries and prolonged analgesia with reduced need for sedation and rescue analgesics with less side effects.

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