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EFFECT OF INTRATHECAL HYPERBARIC BUPIVACAINE WITH DIFFERENT VOLUME OF NORMAL SALINE

Veena Arora — Author, Professor, Department of Anaesthesia, GSVM Medical College, Kanpur

Umesh Uraiya* — Co-author, Department of Anaesthesia, GSVM Medical College, Kanpur
*Corresponding Author

Neha Mishra — Co-author, Department of Anaesthesia, GSVM Medical College, Kanpur

ABSTRACT Pain is defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage. The role of Bupivacaine in spinal anesthesia is well documented. It is a potent long acting amide linked local anesthetic used for infiltration, nerve block, epidural and spinal anesthesia of long duration. We studied the effects of intrathecal hyperbaric bupivacaine with different volume of normal saline on maximum level of sensory block, intensity of block, time to two segment regressions V, time to S2 regression and time to discharge. We also studied any untoward effects of intrathecal bupivacaine with different volume of normal saline on perioperative period. This study was carried out in LLR and associated Hospitals of GSVM Medical College, Kanpur. We selected 100 cases of either sex, between 15-65 years, belonging to ASA I and II who underwent short duration procedures below umbilicus. After pre-medications patients were divided into 3 groups: Group 1 - 3 ml injection of hyperbaric bupivacaine 0.5% (15mg) with dextrose of 8% (240mg). Group 2 - 2ml of injection of hyperbaric bupivacaine 0.5% plus 1 ml normal saline. Injection bupivacaine 0.33% (10 mg) plus dextrose 5.3%(160mg). Group 3 - 1.5ml of injection of hyperbaric bupivacaine 0.5% plus 1 ml normal saline. Injection bupivacaine 0.33% (10 mg) plus dextrose 5.3% (160mg). The purpose of our study was to use a local anesthetic in spinal anesthesia that has shorter duration of action, more hemodynamic stability and less neurological toxicity. Lignocaine in spite of shorter duration of action has neurological toxicities. We were successful in using low dose bupivacaine keeping the volume constant yielding shorter duration of block, hemodynamic stability and no post spinal neurological complaints. In conclusion, the group 4 (5mg) does not have better quality of motor blockade, there is no significant difference in the recovery among the group 3 and group 4 patients but the quality of block was better in group 3(7.5mg). So we find the use of 0.25% bupivacaine(7.5mg) with dextrose 4% more optimal for surgery.

KEYWORDS :

INTRODUCTION

Pain is defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage. Relief of pain during the surgery is the most important component of the balanced anesthesia. Spinal anesthesia is becoming popular all over the world due to number of advantages to the patient. An ideal anesthetic technique should provide a rapid and smooth onset of action, intra-operative analgesia, good surgical condition and short recovery time free from side effects.

The role of Bupivacaine in spinal anesthesia is well documented. It is a potent long acting amide linked local anesthetic used for infiltration, nerve block, epidural and spinal anesthesia of long duration. Bupivacaine concentration used is 0.5% and it is hyperbaric with addition of 8% dextrose is very commonly used drug in spinal anesthesia. The role of hyperbaric bupivacaine is well documented. The question arises whether normal saline is safe effective and tolerable along with intrathecal hyperbaric bupivacaine.

We studied the effects of intrathecal hyperbaric bupivacaine with different volume of normal saline on maximum level of sensory block, intensity of block, time to two segment regression V, time to S2 regression and time to discharge. We also studied any untoward effects of intrathecal bupivacaine with different volume of normal saline on perioperative period.

MATERIALS AND METHODS

This study was carried out in LLR and associated Hospitals of GSVM Medical College, Kanpur. We selected 100 cases of either sex, between 15-65 years, belonging to ASA I and II who underwent short duration procedures below umbilicus.

Exclusion criteria included any pre-existing neurological disease, local infection of the back, active headache, pre-existing Diabetes Mellitus, Hypertension, tuberculosis, myocardial ischemia or any other underlying heart disease, re-existing respiratory disease, renal disease, liver disease, spinal deformity, bleeding tendencies or any known hypersensitivity to test drugs or local anesthetics.

Drugs used for bupivacaine 0.5% and normal saline. All patients were pre -medicated with Inj Midazolam IV 0.1mg/kg, ranitidine IV, Metoclopramide IV and preloaded with crystalloid 10mi/kg body weight. After pre-medications patients were divided into 3 groups:
Group 1 - 3 ml injection of hyperbaric bupivacaine 0.5% (15mg) with dextrose of 8% (240mg)

Group 2 - 2ml of injection of hyperbaric bupivacaine 0.5% plus 1 ml normal saline. Injection bupivacaine 0.33% (10 mg) plus dextrose 5.3%(160mg)

Group 3 - 1.5ml of injection of hyperbaric bupivacaine 0.5% plus 1 ml normal saline. Injection bupivacaine 0.33% (10 mg) plus dextrose 5.3%(160mg)

Sensory testing was done using a 22 gauge needle every 2 minutes until the level has stabilized. Sensory testing was continued every 5 min intra-operatively and every 15 min post operatively. Motor blockade was done using Bromage scale. Data was collected regarding pre-op Pulse rate and mean Blood pressure, time to attain peak level, time to 2 segment regression and patient satisfaction regarding block. Patient's satisfaction regarding block was classified as - complete absence of sensations, sensation of motion only, mild discomfort, discomfort requiring supplementation in form of analgesic and anesthetic agent. Hemodynamic intraoperative monitoring was done every 10 min. Post operatively patients were observed for 24 hours in recovery room, where they were evaluated every hour for hemodynamic stability, assessment of pain relief and any adverse effects and specific treatment given for any adverse effect. Pain score was recorded by the linear analogue method for assessing pain described by Revil et al 1976.

The results of continuous variables are given as mean ± SD and proportion as percentage. The difference between the two groups was assessed by student's unpaired t-test for continuous variables and chi-square test wherever applicable. For all the tests a `p' value of 0.05 and less was considered for statistical significance, using SPSS software.

STATISTICAL ANALYSIS:

The results of continuous variables are given as mean ± SD and proportion as percentage. The difference between the two groups was assessed by student's unpaired t-test for continuous variables and chi-square test wherever applicable. For all the tests a `p' value of 0.05 and less was considered for statistical significance.

RESULTS

Characteristic	Group 1	Group 2	Group 3	Group 4	P value
N	25	25	25	25	
Age +/- SD	33.66 +/- 8.14	35.82 +/- 6.82	32.64 +/- 7.34	33.74+/- 6.78	0.47
Weight(Kg) +/- SD	57.34+/- 7.21	56.20+/- 5.32	53.33+/- 6.88	53.84 +/- 5.98	0.08
Height mean in cm +/- SD	160.88 +/-5.84	161.24 +/-3.46	162.70 +/- 5.76	160.13 +/- 7.34	0.44
Sex M/F	17/8	16/9	18/7	14/11	0.67
Surgery Lower limb/OBGYN	13/12	14/11	11/14	12/13	0.99
ASA physical status I/II	12/13	11/14	13/12	14/11	0.99
Duration of surgery (min) +/- SD	100.27+/ -8.63	98.88+/- 7.36	97.67+/- 7.24	96.68+/- 7.68	0.15
Highest level of sensory block Range (median)	T4-6 (T5)	T6-8 (T8)	T4-11 (T7)	T4-10 (T8)	0.015
Time to peak level mean min +/-SD	8.24+/- 1.32	7.68+/- 1.46	7.12+/- 1.43	6.97+/- 1.64	0.011
Time to 2 segment regression mean +/- SD	109.23+/ -8.46	83.30+/- 10.68	67.86+/- 4.16	56.16+/- 3.26	<0.001
Time to S2 regression mean +/- SD	193.34 +/-6.38	138.45+/ -7.96	112.34+ /-2.78	88.43+/- 3.72	<0.001
Time to discharge mean +/-SD	471+/-35	260+/-15	202+/- 14	181+/-8	<0.001
Bromage scale for motor block (0/1/2/3)	0/0/025	0/1/15/9	0/8/16/1	15/10/0/ 0	
Patient's judgement of block (A/B/C/D)	25/0/0/0	22/2/1/0	20/3/2/0	3/4/4/14	

DISCUSSION

Spinal anesthesia is becoming popular all over the world due to number of advantages to the patient. An ideal anesthetic technique should provide a rapid and smooth onset of action, intra-operative analgesia, good surgical condition and short recovery time free from side effects.

Bupivacaine which is a long acting amide linked local anesthetic used in our study. The concentration of Bupivacaine which is normally used is 0.5% and is made hyperbaric by addition of 8% dextrose.

Our study looked into the effect of intrathecal hyperbaric bupivacaine with different volumes of Normal of saline. It was conducted on 100 patients admitted for undergoing short duration surgeries below umbilicus in orthopedics and gynecological departments in LLR and associated hospitals at GSVM medical college.

Ben david et al 1996 studied about the effect the of bupivacaine with addition of normal saline. He conducted the study in ambulatory surgeries.

Patients were divided randomly into 4 groups, each containing 25 patients. This study is a prospective, double blinded study. The mean age of patients of group 1 was 33.66 +/- 8.14, for group 2 was 35.82 +/- 6.82, group 3 was 32.64 +/- 7.34 and group 4 was 33.74 +/- 6.78. The p value calculated to be 0.47 which is not significant showing groups were comparable to each other for age.

All groups were comparable in terms if weight and height also as shown in table 1(p value 0.47 and 0.08 respectively which is not significant. Also there was no difference found among groups in terms of sex distribution and (p value 0.67) and ASA physical status (p value 0.15).

The groups were compared in highest level of sensory block (measured as the time interval from intrathecal injection to complete sensory blockade) which was found to be significantly better in groups 1 and 2. The groups were compared in time to peak level which is significantly different all four groups.

There was significant difference found between 4 groups in terms of two segment regressions, time to S2 regression and time to discharge. Characteristic of motor block shows group 1, 2 and 3 were significantly better than group 4 according to the contingency table analysis. Preoperative vitals of patients in all patients were not significantly different at onset. Significant reduction in group 1 and 2 was found within the first 30 minutes but it was relatively stable in groups 3 and 4. Incidence of complication was not significantly different between groups in terms of urinary retention, headache and paresthesia.

Cephalad spread of spinal blockade is more influenced by total milligram dose of the total anesthetic than by the volume of the injectate. Dilution of tetracaine 5mg in in 1, 2 or 4 ml of 10% glucose showed no influence of volume on block of height, although the more dilute solution was shorter acting. Belin et al stated that increasing the injectable volume of subarachnoid local anesthetic enhances the spread of anesthesia and therefore allow the use of smaller doses of local anesthetic. So in our study we kept the volume of local anesthetic constant by diluting it with Normal saline. Dilution progressively decreased the milligrams dose of bupivacaine. There was not much effect of dilution over the cephalad spread of sensory block. As per Stephen P hallwarth et al posture and baricity during the induction of spinal anesthesia with intrathecal drugs are believed to be important in determining spread within the cerebrospinal fluid. In this double blinded prospective study, 100 patients undergoing elective cesarean delivery were randomized to receive hyperbaric, isobaric, or hypobaric intrathecal solution of 10mg bupivacaine during spinal anesthesia induced in either sitting or right lateral position. After an intrathecal using a combined a -spinal technique patient's were placed in the supine wedged position. Moller IW et al found that the effects of subarachnoid administration of 0.5% Bupivacaine 4 ml in 8%, 5% or 0% glucose were investigated in a double blind study in 30 women undergoing laparotomy through a lower abdominal incision. The onset time for each segmental spread of analgesia was three to four segments higher with the hyperbaric solutions. Chamber WA et al in a double blinded study of spinal anesthesia was with 0.5% bupivacaine 3ml with no glucose , 5% glucose or 8% glucose all three solutions gave consistently good nerve blocks. The hyperbaric solutions (5% and 8% glucose) produced a greater cephalad spread and were suitable for lower abdominal surgery, whereas the plain solution (no glucose) seldom affected thoracic nerves. Cardiovascular changes were more marked with the hyperbaric solutions but only necessitated treatment on two occasions. The duration of block was not affected by baricity. Huffnagle et al injected 5mg, 7.5mg, 10mg and 12.5mg of intrathecal bupivacaine for postpartum tubal ligation and observed rapid regression in block with decrease in dose and shorter time PACU with 7.5 mg. There were no significant complications in the post operative follow up. In the follow up only 2 % patient's complained of urinary retention which was relieved by catheterization. Walts et al in a study in orthopedic patients undergoing hip arthroplasty showed that bladder catheterization was no more frequent after neuraxial (spinal or epidural) block than after general aneasthesia and narcotic analgesic. Post-dural puncture headache was complained by 2% patients which responded to bed rest, fluid intake and analgesics which were comparable to the study of Eckstein et al. There was no incidence of paresthesia in our study.

CONCLUSION

The purpose of our study was to use a local anesthetic in spinal anesthesia that has shorter duration of action, more hemodynamic stability and less neurological toxicity. Lignocaine in spite of shorter duration of action has neurological toxicities. We were successful in using low dose bupivacaine keeping the volume constant yielding shorter duration of block, hemodynamic stability and no post spinal neurological complaints. In conclusion, the group 4 (5mg) does not have better quality of motor blockade, there is no significant difference in the recovery among the group 3 and group 4 patients but the quality of block was better in group 3(7.5mg). So we find the use of 0.25% bupivacaine(7.5mg) with dextrose 4% more optimal for surgery.

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