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Efficacy of 0.5% Bupivacaine and 0.5% Bupivacaine with Ketamine 50 mg for Neuraxial Blockade – A Comparitive Study

Anaesthesiology

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ABSTRACT

Background: In the present study practice of spinal anaesthesia, bupivacaine is the most commonly used drug for spinal anaesthesia. To improve the quality of analgesia mainly adjuvants have been used. Intrathecal ketamine, which is a NMDA receptor blocker, has analgesic effect at the spinal cord which is due to inhibition of dorsal horn.

Objective: To evaluate the efficacy of spinal anaesthesia with ketamine added to hyperbaric bupivacaine in lower abdominal and lower limb surgeries.

Methodology: The study is a a prospective randomized controlled study. 100 ASA grade I and II aged between 18-60 years undergoing elective lower abdominal, urological, lower limb surgeries were selected and divided into 2 groups of 50 each. Bupivacaine group B received intrathecally 2.5ml of heavy bupivacaine and 1.0 ml of normal saline whereas ketamine group BK received intrathecally 2.5ml of heavy bupivacaine with 50mg ketamine (total 3.5ml). Parameters like onset and duration of sensory and motor block, highest level of sensory blockade, duration of analgesia vitals and side effects were assessed.

Results: The onset of sensory blockade was faster in BK group than compared to group B. Duration of sensory block and analgesia was significantly prolonged in group BK. Haemodynamic parameters were comparatively more stable in group BK.

Conclusion: Ketamine 50mg with 12.5 mg heavy bupivacaine when given intrathecally hastened sensory onset, prolonged the sensory block and improve the quality of analgesia in the early postoperative period.

KEYWORDS:

Bupivacaine, Ketamine, Spinal anesthesia

INTRODUCTION

Spinal anesthesia using local anesthetics like hyperbaric bupivacaine is one of the most popular techniques for both elective and emergency surgical procedures[1]. One disadvantage with spinal anesthesia using hyperbaric bupivacaine alone is relatively shorter duration of action, which means that early analgesic intervention is needed in the postoperative period..A number of adjuvants have been used to improve postoperative analgesia, along with bupivacaine. These are epinephrine, clonidine, ketamine, neostigmine and midazolam[2].

This study was done as a randomised control trial to compare the efficacy of bupivacaine alone to that of addition of ketamaine to bupivacaine.

OBJECTIVE

To compare efficacy of adding ketamine to 0.5% hyperbaric bupivacaine with 0.5% hyperbaric bupivacaine in intrathecal procedures.

METHODOLOGY

This clinical study was conducted on 100 adult patients of ASA physical status 1 & 2 in the age group of 18 years to 60 years, of either sex, posted for elective lower limb, lower abdominal, gynaecological and urological surgeries under spinal anaesthesia after taking informed consent at ASRAM Hospital Eluru over a period of 12 months. After approval from the hospital ethical committee, a comparative study was carried out on 100 adult patients.

Patients were randomly divided on an alternative basis into two groups of 50 each.

Group "B" bupivacaine group- Receiving Intrathecal bupivacaine 12.5mg (2.5mL) +1.0mL normal saline. (total volume of 3.5mL)

Group "BK" Ketamine group- Receiving Intrathecal Bupivacaine 12.5mg (2.5mL) +50mg ketamine(total volume of 3.5mL)

After a thorough pre-operative check-up and investigations, the patients were admitted and shifted to OT the next morning for the surgery. The following parameters were observed and recorded.

Vital Parameters: HR, B.P and RR, SpO2 monitored at 1, 3,5,10,15,20,25, 30,45,60, 120,180 minutes.

Assessment of sensory blockade was tested by pin-prick method using a hypodermic needle. Motor blockade was tested using Bromage Scale[3].

Quality of intre-opeative analgesia was assessed by Visual Analogue Score (VAS)[4].

STATISTICALANALYSIS

The demographic data were analyzed using either Student's t-test or Chi-square test. Quantitative data was analyzed by student's t test and qualitative data was analyzed by Chi-square test. All values were expressed as mean ± standard deviation. $p < 0.05$ was considered statistically significant.

RESULTS & DISCUSSION

Demographic profile across the group: In our study, majority of the patients were middle aged in both groups. There is no statistical significance age-wise or gender-wise, among the study population of the two groups.

Onset of sensory and motor blockade: In our study, the mean time for onset of sensory block in group BK was 3.4 min whereas in group B it was 4.0 min ($p<0.05$). There was statistically significant difference with regard to onset of sensory block between both the groups with group BK having a faster sensory onset than group B. H. Unlugenc et al[5]., in their prospective randomized double blind study, found that – onset of sensory block in group K was 2.8 min whi ch was significantly shorter than group S who had a mean onset of action of 3.6 min.T. Togal et al[6]., also concluded that there was more rapid onset of sensory

block in bupivacaine + ketamine group which was 3.4 min than plain bupivacaine group which was 4.7 min.Thus, our study is comparable to the above studies and we can conclude that onset of sensory block in group BK than was faster than group B. The mean time of onset for motor blockade was 5.0 min in group BK whereas it was 5.4 min in group B (p>0.05). There was no statistical significant difference between the onset times for motor blockade in both the groups.S. Kathirvel et al[7]., also concluded that the onset of motor blockade was statistically not significant though clinically faster. T. Murali Krishan et al[8]., found out in their study that the onset of motor block in ketamine and bupivacaine groups were comparable which was 8.3±3.3 min. and 8.5±3.3 min.

Our study is comparable to the above studies and we can conclude that the motor onset in both the groups are similar.

Highest level of sensory blockade : In our study 96% of group BK achieved a level of T6 whereas 94% of group B achieved T6 level. 4% of group BK achieved a level of T4 whereas in group B. 6% achieved a level of T8.Hamed Sanad et al[9], in their comparative study concluded that all the 4 group attained a comparable block height of T7-T10. Kahtirvel et al[7]., also concluded that in his study the number of segments blocked was same in both the group. Thus, our result correlates with the above mentioned studies i.e., the block height achieved in both group is comparable.

Time for two segment regression The time for 2 segment regression in our study for group BK was 62.5 min whereas in group B it was 58.7 min (p>0.05). Hamed Sanad et al[9]., concluded in their study that the 2 segment regression time was comparable as it was 68.8 min in group BK and 65 min in group B.Kathrivel et al[7]., also concluded that the 2 segment regression time in both groups where similar. Thus, our result correlates with the above study. We can conclude that the 2 segment regression time in group BK and group B are comparable.

Time for complete motor and sensory block recovery: In our study time for complete mo tor recovery in group BK was 160.7 min. whereas in group B it was 157 min.

Quality of intraoperative analgesia : All of the patients in group BK had no pain during the intraoperative period whereas 78% in group B had no pain in the intraoperative period. Hamad Sanad et al[9]., said that the quality of spinal analgesia was excellent i.e., no pain in 90% of patients in group K whereas in group S it was 76.6%. Thus, our study is comparable with the above study and we can conclude that the quality of intraoperative analgesia is better in group BK than group B.

Time to first pain medication :In our study time to first pain medication in group BK was 322.8 where as in group B it was 222.7 min. Hamed Sanad and et al[9], found in their randomized study that time for first medication was 365.4 min in group K and 119 min in group S.T. Murali Krishna and et al[7], found that in ketamine group the pain free interval has 369.7 min whereas in bupivacaine it was 331.5 min.Thus we can conclude that the time to first pain medication was comparable to other studies and that it was more in group BK than group B.

Haemodynamic variables :

Heart rate : In our study it was seen that there was no much ofluctuation in heart rate in ketamine group whereas there was fluctuation in heart rate in group B. T. Togal, et al[6]., also concluded that there was raise in heart rate in group B whereas there is slight decrease in heart rate in group BK.

Thus, we can say that our study is comparable to the above studies and conclude that the heart rate in group ketamine remains more stable than in group bupivacaine.

Systolic and Diastolic blood pressure In our study, we found that systolic and diastolic pressures where significantly lower in bupivacaine group than bupivacaine - ketamine group in the first 20 min. After which the systolic and diastolic pressure were comparable. Though the arterial bp in the bupivacaine group was lower than bupivacaine – ketamine group there was no significa nt hypotension in these patients. Hamed Sanad et al[9]., found in their study that 45% patients in group S had hypotension, whereas only 10% in group K had hypotension. S. Kathirvel et al[7]., also said that in the first 5 min after administration of spinal anaesthesia systolic and diastolic blood pressure were significantly lower in patients who received bupivacaine only.

Thus, we can conclude that the haemodynamic parameters in our study are comparable to the above studies and that bupivacaine – ketamine group have more stable blood pressure after spinal anaesthesia.

CONCLUSION

On basis of our clinical comparative study, we can conclude that the addition of 50 mg ketamine to 0.5% hyperbaric bupivacaine 12.5 mg (2.5ml) in spinal anaesthesia decreases onset of sensory block, and prolongs the duration of sensory blockade. It also prolongs the duration of analgesia and improves the quality of analgesia in the early postoperative period with better haemodynamic stability as compared to bupivacaine alone. It can be used as a beneficial additive for prolonging spinal anaesthesia.

Thus, the study concluded that “addition of ketamine potentiates spinal anaesthesia”.

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