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COMPARISON OF ANALGESIC EFFECTS OF INTRATHECAL DEXMEDETOMIDINE VERSUS MAGNESIUM SULFATE AS ADJUVANTS TO 0.75% ISOBARIC ROPIVACAINE IN INFRAUMBILICAL SURGERIES: A RANDOMISED DOUBLE BLIND INTERVENTIONAL STUDY

Anaesthesiology

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ABSTRACT

Background: This study was designed to compare the efficacy of intrathecal dexmedetomidine and magnesium sulfate for onset & duration of sensory & motor block, duration of analgesia, post operative pain & to evaluate the side effects, if any.

Aim: To compare anesthetic and analgesic properties of intrathecal dexmedetomidine versus magnesium sulfate as adjuvants to 0.75% Isobaric ropivacaine for infraumbilical surgeries.

Method: A total number of 60 patients (ASA class I and II) were selected randomly into two groups, thirty in each group. Group-A received 3 ml of 0.75% isobaric ropivacaine with 0.5 ml (10 mcg) dexmedetomidine and Group-B received 3 ml of 0.75% isobaric ropivacaine with 0.5 ml (75mg) of magnesium sulfate intrathecally. The parameters including pulse rate, blood pressure, onset and duration of motor and sensory block, postoperative pain score in VAS, duration of analgesia, side effects were assessed and recorded.

Result: Onset of sensory and motor block was significantly earlier in group A in comparison to group B. Duration of sensory and motor block also significantly prolonged in group A in comparison to group B. Duration of analgesia was more in group A in comparison to group B

Conclusion: Dexmedetomidine appeared to be better adjuvant in terms of earlier onset, prolonged sensory and motor block with prolongation of the duration of analgesia as compared to magnesium without significant postoperative complications.

KEYWORDS

Dexmedetomidine, Magnesium Sulfate, Ropivacaine.

INTRODUCTION

Post-operative pain management remains a challenge despite recent advances in our understanding of the physiology of acute pain, the development of new opioid and non-opioid analgesics, novel methods of drug delivery (systemic, regional and local) and more widespread use of pain-reducing minimally invasive surgical techniques.[1] LA when used alone is associated with short duration of action. Thus early analgesic intervention is needed in postoperative period. Various adjuvants have been used intrathecally to improve the quality and duration of spinal anaesthesia with better postoperative analgesia like epinephrine, neostigmine, midazolam, ketamine, magnesium sulfate, fentanyl, buprenorphine, clonidine and dexmedetomidine.

Dexmedetomidine is a selective, specific and potent alpha 2 adrenergic agonist and is under evaluation as a neuraxial adjuvant as it provide stable hemodynamic conditions, good quality of intraoperative and prolonged postoperative analgesia with minimal side effects.[2]

Intrathecal magnesium has been found to prolong the duration of analgesia in various surgical procedures like lower limb surgeries and as adjuncts to general anesthesia for pain management.[3,4]

Magnesium blocks calcium influx and noncompetitively antagonizes N-methyl-D-aspartate receptor channels leading to analgesia and can cause side effects of nausea, vomiting, and hypotension at higher doses.[5]

With this background, this study was designed to compare the efficacy of intrathecal dexmedetomidine and magnesium sulfate ($MgSO_4$) for onset & duration of sensory & motor block, duration of analgesia, sedation, post operative pain & to evaluate the side effects, if any.

METHODOLOGY

After getting permission from the institutional ethical committee This hospital based interventional randomized double blind controlled study was conducted on 60 patients of ASA class I or II, 50-80 kgs of weight, 20-50 years of age, undergoing elective infraumbilical surgeries. Patients not willing to participate in the study, uncooperative patient, allergy to any of the study drug and any comorbidity were excluded from the study.

The patients were randomly assigned into either group using a sealed envelope technique. Patients and anesthesiologist who were involved in the patient's clinical assessment and treatment were blinded to the group assignment.

After taking informed written consent a , patient was taken on the operation table and baseline vitals were recorded. After IV line secured patient preloaded with 10ml/kg RL solution. The study drug was prepared according to allotted group. Spinal anaesthesia was performed at L_3-L_4 interspace with the patient in sitting position by using a 25G Quincke needle under strict aseptic conditions. After free flow of CSF, anaesthetic drug was administered according to allotted group.

Group A: 3 ml of 0.75% isobaric ropivacaine + 0.5 ml (10 mcg) of dexmedetomidine.

Group B: 3 ml of 0.75% isobaric ropivacaine +0.5 ml (75mg) of magnesium sulfate.

All patients were immediately placed in supine position. Monitoring was done using continuous electrocardiography (lead II & V1), heart rate, non invasive blood pressure and continuous pulse oximetry and patients were given 4.0 L/min of oxygen by venti-mask.

Vitals were checked every 5 minutes for first 30 minutes then every 10 minutes till the end of surgery and then every 30 min for 12 hour postoperatively.

The onset of sensory block was defined as the time from the intrathecal injection of the study drug to the time taken to achieve anesthesia to pin prick at T_{10} dermatomal level.

Onset of motor block was defined as the time taken from intrathecal injection of the study drug to the time taken to achieve motor block (modified Bromage score 3). Duration of motor block was assessed by recording the time elapsed from modified Bromage scale 3 to 5/6 score. Two segment regression time was defined as time of regression of sensory block by two segments from the highest level attained.

Total duration of analgesia was defined from onset of sensory block till VAS score >3.

Side effects– Hypotension, bradycardia, shivering, nausea vomiting noted.

STATISTICAL ANALYSIS

Statistical analysis was done with statistical programming software –SPSS (Statistical Package for the Social Science) version 21 for windows.

Descriptive values are expressed as mean ± SD or number. The Student t-test was used for comparison between means of continuous variables and normally distributed data, proportions were compared using Chi-squared test. For significance P value was taken<0.05.

RESULTS

In this study satisfactory surgical anaesthesia was attained in all the cases. The demographic data were comparable in both groups (p >0.05)

Table 1: Demographic data expressed as (Mean + SD)

	GROUP A	GROUP B
Age (Yrs)	38.27±8.88	34.93±10.43
Sex (M,F)	18,12	22,8
Weight (kg)	64.97±8.09	64.50±6.83
Height (cm)	168.33±5.01	169.20±6.27
ASA grade(I,II)	26,4	24,6

The mean time to achieve T10 sensory level (onset of sensory block) of group A was 4.85 min, while that of group B was 6.52 min. This difference was statistically significant between two study groups (p<0.001).

The mean time to onset of motor block (min) of group A was 9.93 min, while that of group B was 12.11 min. This difference was statistically significant (p<0.001).

The mean time to 2 segment regression of group A was 252.0 min, while that of group B was 175.80 min which was statistically significant (p<0.001).

The mean duration of motor block of group A was 226.03 min , while that of group B was 171.17 min which was statistically significant(p <0.001).

The mean duration of analgesia of group A was 390.17 min, while that of group B was 199.27 min which was statistically significant (p <0.001).

Table 2: Block (Sensory & motor) and Analgesia. Values are (Mean + SD)

	GROUP A	GROUP B
Time to achieve T10 sensory level (min)	4.85±0.58	6.52±0.95
Time to onset of motor block (min)	9.93±0.71	12.11±0.78
2 segment regression Time (min)	252.00±16.95	175.80±10.86
Duration of Motor Block (min)	226.03±16.94	171.17±11.31
Duration of analgesia (min)	390.17±20.40	199.27±20.21

The mean VAS score was found to be lowest in Group A. This difference in VAS score between two groups was found to be statistically significant at all times from 90 minutes to 210 minutes.

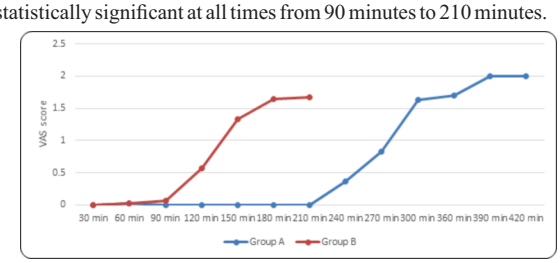

Figure 1. Comparison of post-operative pain VAS between Group-A and Group-B

DISCUSSION

Alpha 2 agonists are widely used in conjunction with local anaesthetics as they permit the use of lower dose of local anaesthetics, while providing adequate anesthesia and analgesia. Dexmedetomidine is under evaluation as a neuraxial adjuvant as it provide stable hemodynamic conditions, good quality of intraoperative and prolonged postoperative analgesia.

NMDA antagonists have role in pre-emptive analgesia and for treating established pain states. Magnesium blocks calcium influx and noncompetitively antagonizes N-methyl-D-aspartate receptor channels leading to analgesia.

This study was conducted to find out the effectiveness of intrathecal dexmedetomidine and magnesium sulfate as adjuvants to 0.75% isobaric ropivacaine in terms of onset time of motor and sensory block, duration of block, duration of analgesia and incidence of side effects. There was no significant difference between the two groups in terms of demographic data.

The mean onset of sensory block was 4.85±0.58 min in Group A and 6.52±0.95 min in Group B which was a statistically significant difference. This result was supported by Shukla et al[6] who conducted a study and found significant rapid onset of surgical anaesthesia in dexmedetomidine group (2.27±1.09 min) when compared to intrathecal magnesium sulfate(6.46±1.33 min).

The mean onset of motor block was 9.93±0.71 min in Group A and 12.11±0.78 min in Group B. Application of Student t- test showed that there was a statistically significant difference between groups (p<0.001).

Similar results also found by Makhni et al[7] where onset of motor block significantly rapid in dexmedetomidine group (9.02±0.8 mins) compared to magnesium group (11.68±2.23 mins).
Mean time to two segment regression was 252.00±16.95 minutes in Group A and175.80±10.86 minutes in Group B.

In our study, the mean time interval from intrathecal administration of the drug to two segment regression of sensory blockade was significantly more in dexmedetomidine group (252minutes) when compared with magnesium sulfate group (175 minutes).Thus dexmedetomidine group produced prolonged duration of sensory blockade in compare to magnesium group.

The results of our study very well match with shukla et al[6] where regression time of sensory block in dexmedetomidine group (352± 45minutes) was prolonged in comparison of magnesium sulfate group (265±65 minutes).

The duration of motor block was 226.03±16.94 minutes in Group A and 171.17±11.31 minutes in Group B. The results of our study very well match with shukla et al[6] where total duration of motor block in dexmedetomidine group (331±35minutes) was prolonged in comparison of magnesium sulfate group(251±51 minutes).

The mean duration of analgesia was 390.17±20.40 minutes and 199.27± 20.21 minutes in group A&B, respectively. Our study showed that patients receiving dexmedetomidine had longer duration of analgesia compared to patients receiving magnesium which was statistically significant (p <0.001). Similar results of mean duration of analgesia also founded by Mahendru et al[8] and Al Mustafa et al[9].

VAS scores were monitored up to time for first request analgesic. VAS scores were statistically significant from 90 minutes to 210 minutes of postoperative period. Analysis with mann whitny test revealed that the VAS scores were highest in magnesium group and lowest in dexmedetomidine group (p<0.05), from 90 minutes postoperatively, up to first request for rescue analgesic.

CONCLUSION

Both dexmedetomidine (10 mcg) and magnesium sulfate (75 mg) were effective and safe as adjuvants to isobaric ropivacaine when given intrathecally in patients undergoing infra umbilical surgeries. Dexmedetomidine appeared to be better in terms of earlier onset, prolonged sensory and motor block with prolongation of the duration of analgesia as compared to magnesium.

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