

Original Research Paper

Anaesthesiology

A COMPARATIVE STUDY TO EVALUATE THE EFFECT OF MAGNESIUM SULPHATE AND NORMAL SALINE AS AN ADJUVANT TO 0.5% ROPIVACAINE ON SENSORY, MOTOR AND POSTOPERATIVE ANALGESIA IN SUPRACLAVICULAR BRACHIAL PLEXUS BLOCKADE

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ABSTRACT AIMS AND OBJECTIVES: To evaluate and compare the onset and duration of sensory and motor blockade and efficacy in prolonging postoperative analgesia of 0.5% ropivacaine with Magnesium sulphate in supraclavicular brachial plexus blockade and to observe undesirable effects and complications of drug used. MATERIAL AND METHOD: 60 patients ASA grade I & II undergoing elective upper limb surgery under supraclavicular brachial plexus blockade . Patients were classified randomly into 2 groups (thirty patients in each group). Group R patients received 30 ml of 0.5% ropivacaine with 0.5 ml normal saline and Group RM patients received 30 ml of 0.5% ropivacaine with 0.5 ml normal saline and Group RM patients received 30 ml of 0.5% ropivacaine with 250 mg (0.5 ml) Magnesium sulphate . And we compare the onset and duration of sensory and motor blockade and efficacy in prolonging postoperative analgesia of 0.5% ropivacaine with Magnesium sulphate in supraclavicular brachial plexus blockade and efficacy in prolonging postoperative analgesia of 0.5% ropivacaine with Magnesium sulphate in supraclavicular brachial plexus blockade and to observe undesirable effects and complications of drug used, if any. RESULT: Analysis revealed that there were no significant differences between the patients with respect to age, sex, weight and duration and type of surgery. Onset of sensory and motor block fasten in RM group and duration of sensory and motor block is more prolong in RM group as compare to R group . Time of rescue analgesia was more in group RM as compare to group R. There was no complication in both the groups. CONCLUSION: Magnesium sulphate when added to ropivacaine fastens the onset of sensory and motor blockade , prolongs the duration of sensory and motor blockade and prolonged the time for rescue analgesia without any side effect.

KEYWORDS : Magnesium sulphate, brachial plexus block and rescue analgesia

INTRODUCTION

Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage.1 Peripheral nerve block not only provides intraoperative anesthesia but also extends analgesia in the postoperative period without major systemic side effects by minimizing stress response and using minimal anesthetic drugs.2

Supraclavicular block provides a rapid, dense, and predictable anesthesia of the entire upper extremity in most consistent manner of any brachial plexus technique.3Brachial plexus is blocked where it is most compact4 i.e. at the middle of brachial plexus, resulting in homogenous spread of anaesthetic throughout the plexus with a fast onset and complete block.5

Brachial plexus is blocked where it is most compact6 i.e. at the middle of brachial plexus, resulting in homogenous spread of anaesthetic throughout the plexus with a fast onset and complete block.7

Local anesthetics alone for supraclavicular brachial plexus block provide good operative conditions but have shorter duration of postoperative analgesia. Hence, various adjuvants like opioids,8 clonidine,9 neostigmine, dexamethasone,10 midazolam,11 etc., were added to local anesthetics in brachial plexus block to achieve quick, dense, and prolonged block, but the results are either inconclusive or associated with side effects. Magnesium is the fourth most plentiful cation in the body and the second most plentiful intracellular cation after potassium.3Magnesium is necessary for the presynaptic release of acetylcholine from nerve endings and may produce effects similar to calcium entry blocking drugs 12 Antinociceptive effects of magnesium are due to regulation of calcium influx into the cell and antagonism of the N-methyl D-aspartate (NMDA) receptors.13Magnesium sulphate has popularly been used as antihypertensive agent.14Many clinical investigations have demonstrated that Mg administration during general anesthesia has reduced anesthetic requirement and postoperative analgesic consumption.15,16Magnesium sulfate is used as an adjuvant mixed with local anesthetics and has been performed with neuraxial anesthesia in both spinal and epidural routes, even with different doses.17-20 Mixing magnesium sulfate as adjuvant with local anesthetics during peripheral nerve and nerve plexus blockade has recently been practiced by anesthesiologists.21-22Although it has an analgesic property, it has not been studied well as an adjuvant to the local anesthetic agents during supraclavicular brachial plexus block.3

MATERIAL AND METHODS:

60 patients ASA grade I & II undergoing elective upper limb surgery under supraclavicular brachial plexus blockade . After obtaining approval from ethical committee 60 patients who fulfilled the eligibility criteria were chosen, explained about the procedure and written consent was taken. Patients were classified randomly into 2 groups (thirty patients in each group). Group R patients received 30 ml of 0.5% ropivacaine with 0.5 ml normal saline and Group RM patients received 30 ml of 0.5% ropivacaine with 250 mg (0.5 ml) magnesium sulphate hydrochloride . And we compare the onset and duration of sensory and motor blockade and efficacy in prolonging postoperative analgesia , Postoperative Pain was assessed using a visual analogue score scale which consists of a 10 cm horizontal scale with gradations marked as '0'means no pain at all and '10'means unbearable pain.(VAS score rating:)23

Also observe undesirable effects and complications of drug used, if any.

OBSERVATIONS

TABLE 1: SHOWING DEMOGRAPHIC PROFILE OF PATIENTS IN TWO GROUPS

S.no.	Parameters	Group R		Group RM		p value
		Mean	±SD	Mean	±SD	
1.	Age (yrs)	42.5	10.33	42.5	7.56	0.44#
2.	Weight (kgs)	58.5	4.83	58.5	5.20	0.45#
3.	Sex (M:F)	25:5		25:5		

Table 1 showing demographic profile of patients in three groups according to age, weight and sex.

VOLUME-7, ISSUE-4, APRIL-2018 • PRINT ISSN No 2277 - 8160

Statistical analysis of Mean \pm SD of Age and Weight of the groups were comparable in all three groups and statistically insignificant (p>0.05).

TABLE 2: SHOWING COMPARISON OF SENSORY BLOCKADE (MIN) IN THE TWO GROUPS.

Parameters	Group R		Group R	М	p value
	Mean	±SD	Mean	±SD	
Onset time of sensory blockade (min)	19.02	3.34	17.58	3.20	<.00\$
Duration of Sensory blockade(min)	325.13	62.32	411.76	42.38	<.00\$

Table2 Showing mean \pm SD of onset and duration of sensory blockade.

Onset time of sensory blockade was 19.02 ± 3.34 min in Group R and 17.58 ± 3.20 min in Group RM.

Duration of sensory blockade is 325.13 ± 62.32 min in Group R and 411.76 ± 42.38 min in Group RM.

Difference between group Rand RM were statistically significant (p <0.05) for onset of sensory blockade. Difference between R vs RM were statistically significant (p <0.05) for duration of sensory blockade.

TABLE 3: SHOWING COMPARISON OF MOTOR BLOCKADE (MIN) AMONG TWO GROUPS.

Parameters	Group R		Group RM		P value
	Mean	±SD	Mean	±SD	
Onset time of motorblockade(min)	22.83	3.68	21.52	1.81	<.00\$
Duration of blockade (min)	300.58	35.39	373.85	41.88	<.00\$

Table 3 Showing the onset time (Mean \pm SD) of motor blockade was 22.83 \pm 3.68 min in Group R and 21.52 \pm 1.81 min in Group RM.

The duration of motor blockade (Mean \pm SD) was found to be 300.58 \pm 35.39 min in Group R and 373.85 \pm 41.88 min in Group RM.

Difference between group R and RM were statistically significant (p <0.05) for onset of motor blockade. Difference between R vs RM were statistically significant (p <0.05) for duration of motor blockade.

TABLE 4: SHOWING TIME FOR RESCUE ANALGESIA (MIN) AMONGTWOGROUPS.

Parameters	Group R		Group RM		p value
	Mean	±SD	Mean	±SD	
Time of	398.93	95.89	480.75	115.96	<.00\$
Rescue					
Analgesia					
(in min)					

Table 4 showing time of rescue analgesia (Mean \pm SD) of three groups.

Time of rescue analgesia was 398.93 ± 95.89 min in Group R and 480.75 ± 115.96 min in Group RM . Difference was statistically significant for Group Rand Group RM

TABLE 5: STATISTICAL ANALYSIS OF VAS SCORE (MEAN \pm SD) AMONGTWO GROUPS.

VAS SCORE (MIN)	GROUP R		GROUP RM		P value
	MEAN	±SD	MEAN	±SD	
10	0	0	0	0	1.0#
15	0	0	0	0	1.0#

30	0	0	0	0	1.0#
60	0	0	0	0	1.0#
90	0	0	0	0	1.0#
120	0	0	0	0	1.0#
150	0	0	0	0	1.0#
180	0	0	0	0	1.0#
210	0	0	0	0	1.0#
270	0	0	0	0	1.0#
300	0	0	0	0	1.0#
330	0	0	0	0	1.0#
360	2.84	0.58	0	0	<.00\$
390	3.47	0.55	0	0	<.00\$
420	4.08	0.57	1.64	0.44	<.00\$
450	4.78	0.55	2.05	0.46	<.00\$
480	5.13	1.12	2.47	0.52	<.00\$
510	5.94	0.65	2.78	0.75	<.00\$
540	6.58	0.68	3.32	0.61	<.00\$
570	7.12	0.77	3.74	0.67	<.00\$
600	7.6	0.71	4.32	0.80	<.00\$
630	8.0733	0.66	4.72	0.84	<.00\$
660	8.58	0.66	5.16	0.87	<.00\$
690	9.0167	0.58	5.57	0.82	<.00\$
720	9.4067	0.42	6.01	0.80	<.00\$
750	9.74	0.32	6.45	0.70	<.00\$

Difference is statistically significant for time intervals 360min, 390min, 420 min, 450min, 480min, 510min, 540min, 570min, 600min, 630min, 660min, 690min, 720min and 750 min between Group R and Group RM.

TABLE 6 SHOWING COMPLICATIONS IN TWO GROUPS

Complications	Group R		Group	RM
	N	%	N	%
Nausea	-	-	-	-
Vomiting	-	-	-	-
Respiratory depression	-	-	-	-
Bradycardia	-	-	-	-
Sedation	-	-	-	-

Table 6 showing there was no complication $% \left({{\rm{B}}_{\rm{B}}} \right)$ in Group R and Group RM .

DISCUSSION

The hypothesis of this study was adding Magnesium sulphate to Ropivacaine in supraclavicular brachial plexus block enhanced the duration of sensory and motor block

DEMOGRAPHIC DATA:

In our study there is even distribution of age ,weight and sex in both groups.(Table-1) and we find that it was statistically insignificant (p >0.05)

SENSORY BLOCKADE: Onset and duration of sensory of block:

In our study the onset time of sensory blockade (mean \pm SD) which was 19.02 ± 3.34 min in Group R and 17.58 ± 3.20 min in Group RM.

Mean (\pm SD) of sensory blockade duration was 325.13 \pm 62.32 min in group R and 411.76 \pm 42.38 min in group RM. The onset of sensory blockade was found to be rapid and duration of sensory block is more in group RD as compared to group R the difference was statistically in significant (p >0.05).

Mukherjee et al3 evaluated the effect of magnesium sulphate added to ropivacaine for brachial plexus block. They found a statistically significant prolongation of duration of sensory blockade, 16.27 \pm 3.07 min in Group RM then 15.91 \pm 1.60 min in Group R (p < 0.01). These results are in accordance with our study.

MOTOR BLOCKADE: Onset and duration of motor blockade:

In our study the onset time (Mean \pm SD) of motor blockade was 22.83 \pm 3.68 min in group R and 21.52 \pm 1.81 min in Group RM.

The difference was statistically insignificant (p >0.05) when group RM was compared to group R.

Duration of motor blockade (mean \pm SD) was 300.58 \pm 35.39 min in group R and 373.85 \pm 41.88 min in Group RM.

Our observations are in accordance with the findings of Mukherjee et al3 who found that addition of 150 mg magnesium sulphate to ropivacaine 0.5% prolonged the duration of motor blockade as compared to ropivacaine alone (366.62 ± 24.42 min vs242.16 ±23.86 min respectively).

Our findings are at variance with that of Reddy et al 24 in which they showed no statistically significant difference in duration of motor block.

TIME OF RESCUE ANALGESIA

In our study the time of rescue analgesia was $398.93\pm$ 95.89min min in group R and $480.75\pm$ 115.96 min in Group RM. The time of rescue analgesia as assessed by VAS score was prolonged in Group RM as compared to Groups R (RM>R).

On comparison these changes were found to be statistically significant (p<0.05).

Our findings are supported by Reddy et al24 who evaluated that addition of magnesium sulphate to ropivcacaine significantly increased duration of analgesia from 676.0 \pm 89.55 to 855.8 \pm 73.66 min respectively (p<0.001).

Mukherjee et al3 found that magnesium sulphate when added to ropivacaine, significantly prolongs the duration of analgesia from $379.0\pm$ min to $461.71\pm$ (p < 0.02) and support our study.

CONCLUSION

Magnesium sulphate when added to ropivacaine fastens the onset of sensory and motor blockade, prolongs the duration of sensory and motor blockade and prolonged the time for rescue analgesia without any side effect.

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