



ORIGINAL RESEARCH PAPER

Anaesthesiology

EFFICACY OF ADDITION OF MAGNESIUM AS AN ADJUVANT TO LOCAL ANAESTHETICS IN PERIBULBAR BLOCK: A PROSPECTIVE RANDOMIZED DOUBLE-BLIND STUDY

KEY WORDS: Magnesium Sulphate, Peribulbar Block.

Dr Sujata Jamadar*

Department of Anaesthesia Institution/Hospital of affiliation: Malla Reddy Narayana Multispeciality Hospital, Hyderabad. *Corresponding Author

Dr. Surender Pasupuleti

Department of Anaesthesia Institution/Hospital of affiliation: Malla Reddy Narayana Multispeciality Hospital, Hyderabad.

ABSTRACT

Introduction: Topical, regional or general anesthesia can be used for ocular surgery. Among regional blocks, Peribulbar block is a good choice as it provides efficient anesthesia with good lid and globe akinesia with low incidence of complications.¹ However the time for onset of akinesia with Peribulbar block is much longer in comparison to retro bulbar block,² which may lead to a delay to start the surgery. The incidence of inadequate analgesia is also more frequent with Peribulbar block² in comparison to retro bulbar block, which may lead to the requirement of supplementary injection before the start of surgery or intraoperatively.

Aims And Objectives: To evaluate the effect of addition of magnesium sulphate to standard local anesthetics mixture for peribulbar blocks in ophthalmic surgeries.

Material And Methods: 60 patients who underwent ocular surgery under local anesthesia admitted at Malla Reddy Narayana Multispeciality Hospital, Hyderabad from May2018- october2018(6 months) were enrolled in the study. It was Prospective Randomized controlled double blind study. Inclusion criteria was patients between 20-70 years of either sex with ASA group 1-3 with both anterior and posterior chamber surgery under peribulbar block. Exclusion criteria were patient with mental retardation, allergic to local anesthetics, history of bleeding disorder, cardiac and respiratory diseases and ASA group4-5.

Results: After studying 60 patients, out of which 30 patients included in control group (Group NS) and 30 patients in study (Group MS) group, a systematic statistical analysis done for Age and All patients were in age group of 20-70 years. Mean age was 59.0667 +- 7.08049 in the control group (Group NS) and 58.1667 +- 5.73605 in study group (Group MS). The p-value 0.591, which is statistically nonsignificant.

Discussion: Anaesthesia plays a vital role in ophthalmic surgery. Most ophthalmic surgeries are carried out under local anesthesia although topical anaesthesia is soon gaining popularity. The goal of anaesthesia in ophthalmic surgery is to provide adequate analgesia and akinesia. Peribulbar block has been used widely for ophthalmic surgery as it is safer than a retrobulbar block. The time for onset of akinesia with peribulbar block is much longer in comparison to retrobulbar block², which may lead to a delay to start the surgery. The incidence of inadequate analgesia is also more frequent with peribulbar block² in comparison to retrobulbar block, which may lead to the requirement of supplementary injection before the start of surgery or intraoperatively.

Conclusions: Faster onset of globe and lid akinesia after addition of Magnesium sulphate to the mixture of local anaesthetics in peribulbar block. The duration of globe and lid akinesia is prolonged but difference is not statistically significant in Group MS as compared to Group NS.

INTRODUCTION:

Topical, regional or general anesthesia can be used for ocular surgery. Among regional blocks, Peribulbar block is a good choice as it provides efficient anesthesia with good lid and globe akinesia with low incidence of complications.¹ However the time for onset of akinesia with Peribulbar block is much longer in comparison to retro bulbar block,² which may lead to a delay to start the surgery. The incidence of inadequate analgesia is also more frequent with Peribulbar block² in comparison to retro bulbar block, which may lead to the requirement of supplementary injection before the start of surgery or intraoperatively.

Magnesium is the fourth most prevalent cation in the body; it has the properties of non-competitive inhibition of N-methyl-aspartate (NMDA) receptor channels and blocking of calcium influx³. Magnesium is an additive drug with analgesic and antinociceptive characters.

It is used with local anesthetic to prolong the analgesia by blocking N-methyl-aspartate (NMDA) channels in voltage dependent fashion and prevent the induction of central sensitization by peripheral nociceptive stimulation.⁴

These properties have prompted using magnesium as an adjuvant for local anesthetics in different techniques as magnesium improves the effect of local anesthetics on peripheral nerve^{5,6}. Thus, it has been used with local anesthetics in various regional anesthesia techniques hasten the onset time of block and to improve the quality and duration of anesthesia⁷⁻¹¹.

Present study is undertaken to evaluate the efficacy of magnesium sulfate as an adjuvant to Local anesthesia for peribulbar block.

AIMS AND OBJECTIVES:

To evaluate the effect of addition of magnesium sulphate to standard local anesthetics mixture for peribulbar blocks in ophthalmic surgeries.

1. Time for onset of the globe and lid akinesia
2. Duration of action of globe and lid akinesia
3. Surgeon satisfaction
4. Side effects if any significant

MATERIAL AND METHODS:

60 patients who underwent ocular surgery under local anesthesia admitted at Malla Reddy Narayana Multispeciality Hospital, Hyderabad from May2018- october2018(6 months) were enrolled in the study. It was Prospective Randomized controlled double blind study. Inclusion criteria was patients between 20-70 years of either sex with ASA group 1-3 with both anterior and posterior chamber surgery under peribulbar block. Exclusion criteria were patient with mental retardation, allergic to local anesthetics, history of bleeding disorder, cardiac and respiratory diseases and ASA group4-5. An informed consent was taken from all the patients prior to the initiation study. On the day of surgery patients had received mydriatic or cycloplegic drops as per the requirement of surgery. No sedative premedication was given during preoperative period. Ethical committee approval was

taken from the institution ethical committee.

In the preoperative room after securing intravenous line, standard monitors were connected and HR, ECG, Oxygen Saturation, Non-Invasive Blood Pressure were monitored.

Patients were randomly divided into two groups using closed envelope method (30 patients in each group). The anesthesiologist who was not involved in the study had prepared the solution for peribulbar block.

The anesthesiologist who had prepared the solution for peribulbar block was not included in the study.

Procedure:

Peribulbar block was given with 26 gauge, 1/2 inch needle. The first injection was just superior to the infraorbital rim in the inferotemporal quadrant and second injection just lateral to supra-trochlear notch. Time interval between the two injections was less than 1min. After that gentle massage for 2min given.

Group NS had received 4.5 ml of 2% lignocaine + 4.5 ml of 0.5% bupivacaine with 150 IU of hyaluronidase and 1 ml of 0.9% saline.

Group MS had received 4.5 ml of 2% lignocaine + 4.5 ml of 0.5% bupivacaine with 150 IU of hyaluronidase and 50 mg of MgSO4 in 1 ml of saline (1 ml 50% MgSO4 diluted in 10 ml saline = 50 mg / ml MgSO4)

The onset of lid and globe akinesia, satisfactory block and complications were observed by an independent observer.

Lid & globe akinesia were assessed every 2 minutes till complete akinesia was achieved. The onset of lid and globe akinesia was taken from the time of injection to the occurrence of complete akinesia.

The degree of globe and lid akinesia assessed on a scale of 0-2 by the method described by sarvela⁹⁸.

Scoring system of global akinesia with Akinesia of extra ocular muscles including levator muscle

- 0: 0-1 mm movement in 1 or 2 main directions or 0-4 mm movement in levator muscle
- 1: 1 mm movement in >2 main directions, 2 mm movement in any main direction, or >4 mm movement in levator muscle
- 2: ≥2 mm movement in any main direction or 2 mm movement in 2 or more main directions

- 0=complete akinesia,
- 1=partial akinesia,
- 2=no akinesia.

The occurrence of complete akinesia considered as satisfactory block.

Time taken for obtaining complete akinesia was recorded in all the patients. After completion of the surgery, the return of the eye movements were assessed every 15min till complete recovery. The time taken from the complete onset of akinesia to the complete recovery was taken as the duration of akinesia. Any side effect or complication of the block such as hemorrhage, globe perforation brain stem anesthesia was recorded, and appropriate management was done according to standard protocol

RESULTS:

After studying 60 patients, out of which 30 patients included in control group (Group NS) and 30 patients in study (Group MS) group, a systematic statistical analysis done for Age and All patients were in age group of 20-70 years. Mean age was 59.0667 +- 7.08049 in the control group (Group NS) and

58.1667 +- 5.73605 in study group (Group MS). The p-value 0.591, which is statistically non-significant.

After studying 60 patients, out of which 30 patients included in control group (Group NS) and 30 patients in study group (Group MS) it was found out that In control (Group NS) group out of 30 patients 13(43.33%) were male and 17(56.67%) were females. In the study (Group MS) group out of 30 patients 10(33.33%) were males and 20(66.67%) were females.

Comparison of onset of globe akinesia between two groups:

After studying 60 patients, out of which 30 patients included in control group (Group NS) and 30 patients included in study (Group MS) group, a systematic statistical analysis done for onset of globe akinesia.

Table No. 1: Comparison Of Onset Globe Akinesia Between Two Groups

Time (min)	CONTROL GROUP (Group NS)		STUDY GROUP (Group MS)	
	No. of Patients	Percentage	No. of Patients	Percentage
<1	0	0	0	0
2	0	0	25	83.33
4	4	13.33	4	13.33
6	11	36.67	1	3.33
8	12	40	0	0
10	3	10	0	0
12	0	0	0	0
Total	30	100	30	100
Mean+SD	6.8966 +- 1.73915		2.400 +- 0.96847	
t-value	12.324			
p-value	0.000			

Neither the patients in control Group(GroupNS) nor in study(Group MS) group had globe akinesia at <1min. In control group(GroupNS) out of 30 patients no one had globe akinesia at 2min, in study group(GroupMS) out of 30 patients 25(83.33%)patients had globe akinesia at 2min.

In control group(Group NS) group out of 30 patients 4(13.33%)patients had globe akinesia at 4min, in study group(GroupMS) out of 30 patients 4(13.33%) patients had globe akinesia at 4min.

In control group(Group NS) out of 30 patients 11(36.67%) patients had globe akinesia at 6min, in study group(Group MS) out of 30 patients 1(3.33%) patients had globe akinesia at 6min. In control group(Group NS) out of 30 patients 12(40%)patients had globe akinesia at 8min, in study group(Group MS) out of 30 patients not any patients had globe akinesia at 8min.

In control group(Group NS) out of 30 patients 3(10%) patients had globe akinesia at 10min, in study group(Group MS) out of 30 patients not any patients had globe akinesia at 10min. Neither the patients in control(Group NS)group nor in study(Group MS) group had globe akinesia at 12min.

Mean time for the onset of globe akinesia was 6.8966 +- 1.73915 for control group(Group NS), and for study group(group MS) it was 2.400 +- 0.96847 .The p-value 0.000, which is statistically significant.

In the present study it was observed that there was statistically significant difference in the mean time for the onset of globe akinesia between two groups (p-value<0.05)

Comparison of onset of lid akinesia between two groups:

After studying 60 patients, out of which 30 patients included in control group(Group NS) and 30 patients included in study(Group MS) group, a systematic statistical analysis done for onset of lid akinesia.

Table 2: Comparison Of The Onset Of Lid Akinesia Between Two Groups

Time (min)	CONTROL GROUP (Group NS)		STUDY GROUP (Group MS)	
	No. of Patients	Percentage	No. of Patients	Percentage
<1	0	0	0	0
2	0	0	30	100
4	11	36.33	0	0
6	15	50	0	0
8	4	13.33	0	0
10	0	0	0	0
12	0	0	0	0
Total	30	100	30	100
Mean+SD	5.5172 +- 1.37894		2.00 +- 0	
t-value	13.975			
p-value	0.000			

Neither the patients in control (Group NS) group nor in study (Group MS) group had lid akinesia at <1min. In control group (Group NS) out of 30 patients no one had lid akinesia at 2min, in study group (Group MS) out of 30 patients 30(100%) patients had lid akinesia at 2min. In control group (Group NS) out of 30 patients 11(36.33%) patients had lid akinesia at 4min, in study group (Group MS) out of 30 patients not any patients had lid akinesia at 4min. In control group (Group NS) out of 30 patients 15(50%) patients had lid akinesia at 6min, in study group (Group MS) out of 30 patients not any patient had lid akinesia at 6min. In control group (Group NS) out of 30 patients 4(13.33%) patients had lid akinesia at 8min, in study group (Group MS) out of 30 patients not any patients had lid akinesia at 8min. Neither the patients in control (Group NS) group nor in study (Group MS) group had lid akinesia at 10min and 12min. Mean time for the onset of lid akinesia was 5.5172 +- 1.37894 for control group (Group NS), and for study group (Group MS) it was 2.00 +- 0. The p-value 0.000, which is statistically significant.

In the present study it was observed that there was statistically significant difference in the mean time for the onset of lid akinesia between two groups (p-value<0.05)

Comparison of duration of globe akinesia:

After studying 60 patients, out of which 30 patients included in control group (Group NS) and 30 patients included in study (Group MS) group, a systematic statistical analysis done for duration of globe akinesia.

Table 3: Comparison Of Duration Of Globe Akinesia Between Two Groups

Time (min)	CONTROL GROUP (Group NS)		STUDY GROUP (Group MS)	
	No. of Patients	Percentage	No. of Patients	Percentage
150-199	2	6.67	0	0
200-249	15	50	19	63.33
250-299	10	33.33	11	36.67
300-350	3	10	0	0
Total	30		30	100
Mean+SD	250.4828 +- 32.39447		253.4138 +- 22.50234	
t-value	-0.444			
p-value	0.658			

In the present study it was observed that there was statistically non significant difference in the mean time for the duration of globe akinesia between control and study group (p-value>0.05). Hence we have an evidence to say that addition of magnesium to the mixture of local anaesthetics in peribulbar block for ophthalmic surgeries not affecting the duration of globe akinesia

Comparison of duration of lid akinesia:

After studying 60 patients, out of which 30 patients included in

control group (Group NS) and 30 patients included in study (Group MS) group, a systematic statistical analysis done for duration of lid akinesia

Table 4: Comparison Of Duration Of Lid Akinesia Between Two Groups

Time (min)	CONTROL GROUP (Group NS)		STUDY GROUP (Group MS)	
	No. of Patients	Percentage	No. of Patients	Percentage
150-199	0	0	0	0
200-249	2	6.67	0	0
250-299	21	70	21	70
300-350	7	23.3	9	30
Total	30	100	30	100
Mean+SD	282.4138 +- 23.54406		284.2333 +- 24.95746	
t-value	-0.288			
p-value	0.775			

In the present study it was observed that there was statistically non significant difference in the mean time for the duration of lid akinesia between control and study group (p-value>0.05). Hence we have an evidence to say that addition of magnesium to the mixture of local anaesthetics in peribulbar block for ophthalmic surgeries not affecting the duration of lid akinesia.

On statically comparison of pain during surgery, there was statistically significant difference between control and study group. Statically comparison of Complications such as chemosis as insignificant. Vital parameters such as blood pressure, mean arterial pressure, heart rate was also insignificant between the two groups.

DISCUSSION:

Anaesthesia plays a vital role in ophthalmic surgery. Most ophthalmic surgeries are carried out under local anaesthesia although topical anaesthesia is soon gaining popularity. The goal of anaesthesia in ophthalmic surgery is to provide adequate analgesia and akinesia. Peribulbar block has been used widely for ophthalmic surgery as it is safer than a retrobulbar block. The time for onset of akinesia with peribulbar block is much longer in comparison to retrobulbar block², which may lead to a delay to start the surgery. The incidence of inadequate analgesia is also more frequent with peribulbar block² in comparison to retrobulbar block, which may lead to the requirement of supplementary injection before the start of surgery or intraoperatively.

El-Hamid et al¹³ in their study, found the significant rapid onset of globe akinesia in the magnesium group patients compared with the clonidine group patients as an adjuvant to local anesthetic in peribulbar block for posterior segment eye surgeries. In our study, both anterior and posterior segment surgeries were included and rapid onset of globe akinesia has been noted when magnesium added as adjuvant to local anaesthetics.

Mona Mohamed Mogahed et al¹⁵ also reported that administration of magnesium sulphate at different doses in peribulbar block enhances the onset of sensory and motor blockade without adverse effects with reduction of the postoperative analgesic requirements.

Sinha R. et al¹⁴ reported that addition of magnesium sulphate to the local anaesthetic mixture results in the earlier onset of globe akinesia. Magnesium sulphate does not cause any side-effect at given dose.

El-Hamid et al¹³ also found the significant rapid onset of lid akinesia in the magnesium group patients compared with the clonidine group patient as an adjuvant to local anesthetic in peribulbar block. In our study rapid onset of lid akinesia has been noted in magnesium group.

Sinha R. et al¹⁴ also reported that addition of magnesium sulphate to the local anesthetic mixture results in the earlier onset of lid akinesia. Magnesium sulphate does not cause any side-effect at given dose.

In the present study, the onset of globe and lid akinesia was statistically faster in the Group MS as compared to the Group NS. Our result correlates with the above mentioned studies. Hence we conclude that addition of magnesium to the standard mixture of local anaesthetic in peribulbar block is an effective.

El-Hamid et al¹³ also found the longer duration of globe akinesia in peribulbar block in the patients receiving clonidine with local anesthetic in comparison to the patients receiving magnesium. So magnesium does not cause significant prolongation of globe akinesia. In our present study prolongation of globe akinesia was not significant in Group MS. Magnesium sulphate only caused rapid onset of anaesthesia.

Mona Mohamed Mogahed et al¹⁵ reported that administration of magnesium sulphate at different doses in peribulbar block enhances the prolong duration of sensory and motor blockade without adverse effects with reduction of the postoperative analgesic requirements. The results were more significant on using 100 mg magnesium sulphate. As in our study we used the 50mg of magnesium sulphate no significant prolongation block has been noted.

El-Hamid et al¹³ also found the longer duration of lid akinesia in peribulbar block in the patients receiving clonidine with local anesthetic in comparison to the patients receiving magnesium. So magnesium does not cause significant prolongation of lid akinesia. In our present study prolongation of lid akinesia was not significant in Group MS. Magnesium sulphate only caused rapid onset of anaesthesia.

Our result correlates with the above mentioned studies. Hence we conclude that addition of magnesium to the standard mixture of local anaesthetic in peribulbar block is an effective.

M. Ozalevli. T. O. Cetin. T. Guler et al stated that at high doses the adverse effects of parenterally administered magnesium usually are the result of magnesium intoxication. These include flushing, sweating, hypotension, depressed reflexes, flaccid paralysis, hypothermia, circulatory collapse, cardiac and CNS depression proceeding to respiratory paralysis^{16,17}.

In the present study, as we used small dose, 50mg of magnesium sulphate there were no additional complications apart from chemosis which may be attributed to peribulbar block²⁷ in both the groups. Magnesium is safe drug, and most of the studies showed no side effects with its use at the dose of 50 mg.

Co-administration of peribulbar magnesium local anesthetic produces predictable rapid onset of anesthesia without any side-effects¹⁵.

Our result correlates with the above mentioned studies. Hence we conclude that addition of magnesium to the standard mixture of local anaesthetic in peribulbar block is an effective and safe.

Akansha et al did a study on effect of continuous infusion of magnesium sulphate to spinal anaesthesia and found out that hemodynamic depression was not seen in our study and hemodynamic variability did not differ from the control group¹⁸.

When we monitored hemodynamic parameters of both

control and study group, there is no significant difference or hemodynamic instability observed in control group as compared to study group and shows that magnesium does not cause any significant hemodynamic changes.

So after comparing above studies with our study it is observed that magnesium can be used safely and effectively as an adjuvant to the standard mixture of local anaesthetics in peribulbar block.

CONCLUSIONS:

Faster onset of globe and lid akinesia after addition of Magnesium sulphate to the mixture of local anaesthetics in peribulbar block. The duration of globe and lid akinesia is prolonged but difference is not statistically significant in Group MS as compared to Group NS. The rate of ocular complications was negligible after addition of magnesium to local anaesthetic. Quality of block is good in Group MS although no statistically significant difference in Surgeon satisfaction score has been noted when magnesium was added to the local anaesthetic. So, the present study showed that magnesium sulfate can become an effective, safe adjuvant to local anaesthetic in peribulbar block.

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