

EVALUATION OF THE EFFECT OF MAGNESIUM SULPHATE VS. CLONIDINE AS ADJUNCT TO LOCAL ANESTHETIC DURING PERIBULBAR BLOCK

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ABSTRACT

Purpose: This study was designed to compare the effects of magnesium sulphate vs. clonidine co administered peribulbarly as adjunct to local anesthesia. **Patients and methods:** The study comprised 60 patients undergoing posterior segment eye surgeries. The patients were then divided randomly into three groups (20 patients in each group) according to the medications they received: Group O (control group): local anesthetic + saline 0.9% (1 ml). Group M: local anesthetic + magnesium sulphate 50 mg (in 1 ml 0.9% saline) Group C: local anesthetic + clonidine 30 mcg (1 ml). The onset and duration of lid and globe akinesia were assessed every 1 minute until maximum blockade and then every 15 minutes after surgery until complete recovery of the block. Postoperative analgesia was assessed by using Visual Analogue Score (VAS) every hour up to 6 hours postoperatively. If the VAS was > 5, injection of diclofenac 75mg intramuscular was done. **Results:** Patients received magnesium sulphate showed significantly rapid onset of lid and globe akinesia than other groups while patients received clonidine showed significantly prolonged duration of lid and globe akinesia than other groups. First analgesic requirement is significantly delayed in group M and group C in comparison with the control group (group O). There were statistically significant differences between the groups as regard the mean VAS in 1,2,3,4 hours, M group and C group have lower median pain score than Control group (control group). **Conclusion:** The current study establishes magnesium sulphate as a predictable and safe adjunct to local anesthetic in peribulbar block for rapid onset of anesthesia and clonidine for prolonged duration of anesthesia.

Introduction:

Peri-bulber eye block is a safe and inexpensive technique with the advantage of providing efficient anesthesia with good lid and globe akinesia. It is also an effective treatment of operative pain. It has become a common practice to use polypharmacy approach to enhance the onset and increase the duration of the block, because no drug has yet been identified that specifically inhibits nociception without associated side effects. Research continues concerning different techniques and drugs that could provide better anesthesia and postoperative pain relief^[1]

Magnesium sulfate has been used for many years on an empirical basis to control convulsions in patients with preeclamptic toxemia. Magnesium ions are essential for

many biochemical reactions, and a deficiency may produce clinically important consequences. Many of the pharmacologic properties have only more recently been appreciated. Magnesium is the fourth most prevalent cation in the body and activates approximately 300 enzyme systems, including many involved in energy metabolism.^[2]

Because the biological basis for its potential antinociceptive effect is promising.^[3] These effects are primarily based on physiological calcium antagonism, that is voltage-dependent regulation of calcium influx into the cell, and noncompetitive antagonism of N-methyl-D-aspartate (NMDA) receptors.^[4]

Clonidine is a selective partial agonist for α_2 -adrenoreceptors, with a ratio of approximately 200:1 (α_2 to α_1).^[5] Clonidine is lipid soluble so, it penetrates the blood-brain barrier to reach the hypothalamus and medulla. Although experience with α_2 -agonists as sole anesthetics is limited,^[6] Data suggest that oral, intravenous, epidural, and intrathecal administration of clonidine potentiates the anesthetic action of other anesthetics, volatile or injectable, and reduces general and regional anesthetic requirements with correspondingly fewer side effects.^[7] In addition to its use in the operative setting, the addition of clonidine to local anesthetic increases the duration of analgesia and reduces dose requirements for local and narcotic pain medications.^[8] The aim of this study is to compare the effects of magnesium sulphate vs. clonidine co-administered peribulbarly as adjunct to local anesthesia.

Patients and methods:

After obtaining institutional ethical committee approval and written informed consent, 60 patients belonging to ASA physical status I and II, undergoing posterior segment eye surgeries aged 18 to 60 years and axial eye length ranged from 22 to 28 mm. Patients with history of adverse reaction to any study medication, coagulation disorders, and where communication difficulties preventing reliable assessment were excluded from this study.

After intravenous access, a combination of midazolam (1 mg), fentanyl (30 μ g), and propofol (50 mg) are given to provide amnesia and sedation for the placement of the blocks. All patients

had peribulbar anesthetic block using 10 ml of bupivacaine 0.5% and lidocaine 2% without epinephrine 1:1 ratio. Hyaluronidase (150 units) is added to speed tissue penetration.

The patients were then divided randomly into three groups (20 patients in each group) according to the medications they received: Group O (control group): local anesthetic + saline 0.9% (1 ml). Group M: local anesthetic + magnesium sulphate 50 mg (in 1 ml 0.9% saline) Group C: local anesthetic + clonidine 30 mcg (1 ml).

Light orbital compression for 1 minute then evaluation after 1 minute, 3 min, 5 min, and 10 minutes. The onset and duration of lid and globe akinesia were assessed every 1 minute until maximum blockade and then every 15 minutes after surgery until complete recovery of the block.

Motor block evaluation includes lid akinesia (lid closure by orbicularis and lid opening by the levator) and globe akinesia using 3 point scale for every muscle was done using the score system that shown in (Table 1).

For assessment of lid akinesia the patients were asked to open their eyelids and then squeeze them together maximally. Orbicularis oculi muscle was assessed separately by using the score in (Table 1). Also levator palpebrae muscle for opening eye lid was assessed by the score in (Table 1). Globe akinesia was assessed at 1 min., then 3 min., 5 min., 10 min. and 15 minutes. These were scored using the movements of the extra ocular muscles in all 4 main directions on a scale of 0 to 2 as shown in (Table 1). The block was considered satisfactory when loss of at least two movement of the 4 cardinal direction.

Akinesia of extraocular muscles including the levator muscle.

0 = 0 - 1 mm movement in 1 or 2 main directions.

or 0 to 4 mm movement in levator muscle.

1 = 1 mm movement in more than 2 main directions or 2 mm movement in any main direction or more than 4 mm movement in levator muscle.

2 = > than 2 mm movement in any main direction or 2 mm movement in 2 or more main direction

Akinesia of orbicularis muscle.

0= Complete akinesia.

1= Partial movement in either or both eyelid margins.

2= Normal movement in either or both eyelid margins.

Table 1 Scoring system⁹

Arterial blood pressure, heart rate and oxygen saturation (SpO₂) were checked every 15 minutes during the entire procedure and every 30 minutes during the first two postoperative hours. Hypotension and bradycardia were defined as a 20% decrease in blood pressure and heart rate in relation to pre-block value. Postoperative analgesia was assessed by using Visual Analogue Score (VAS) every hour up to 6 hours postoperatively as 0 (no pain) to 10 (maximum pain imaginable). If the VAS was >5, injection of diclofenac 75mg intramuscular was done.

Statistical analysis: was done using SPSS version 16, and the tests used are Chi-square and ANOVA. A value of P<5% was considered statistically significant. The results are expressed as mean (SD).

Results:

-There were no significant differences in age, sex, body weight, and the duration of surgery between the groups (Table 2).

	Group O	Group M	Group C	P value
Age(years)	37.96(9.61)	43.52(8.52)	35.8(9.51)	0.07
Sex(male: female)	17:3	16:4	11:9	0.73
Weight(kg)	62.48(10.76)	66.92(10.78)	64.88(10.8)	0.47
Duration of surgery(hours)	109.2(9.48)	111.28(13.3)	116.32(11.56)	0.58

Table (2): Patient's demographic data given as mean (SD)

The onset of eye lid akinesia is most rapid in group M rather than the two other groups ($X^2 = 11.6$; $P > 0.05$), while the

duration of lid akinesia is highly significant in group C (196.2 ± 5.8) ($P < 0.05$) (Table 3).

Table (3): Comparison between groups in eye lid akinesia having grade 0 akinesia (Complete akinesia)

Lid akinesia		Group O		Group M		Group C		X ² =11.6 p>0.05
onset	No.	%	No.	%	No.	%		
1 min.	1	5	8	40	4	20		
3 min.	15	75	12	60	15	75		
5 min.	3	15	0	0	1	5		
10 min.	1	5	0	0	0	0		
Duration of lid akinesia		121.8±5.9		140.8±6.3*		196.2±5.8*+		P<0.05

* Significant difference from group O
+ Significant difference from group M

The onset of eye globe akinesia is most rapid in group M rather than the two other groups (X² = 21.1; P < 0.05), while

the duration of globeakinesia is highly significant in group C (293.7±5.7) (P< 0.05) (Table 4).

(Table 4).Comparison between groups in eye globeakinesia having grade 0 akinesia (Complete akinesia)

Globe akinesia		Group O		Group M		Group C		X ² =21.1 p<0.05
onset	N o.	%	No.	%	No.	%		
1 min.	0	0	1	5	1	5		
3 min.	3	15	15	75	13	65		
5 min.	1 3	65	4	20	5	25		
10 min.	3	15	0	0	1	5		
15 min.	1	5	0	0	0	0		
Duration of globe akinesia		184.5±5.9		220.75±5.8*		293.7±5.7*+		P<0.05

* Significant difference from group O
+ Significant difference from group M

As regard the first analgesic request group M and group C are highly significant than group O (control group) with no significant difference between both groups. (X²=47.9; p<0.05) (Table 5).

There was statistically significant differences between the control group and

the two other groups as regard the median VAS at 1, 2, 3, 4, 5, 6 hours control group had higher median pain score than the other two groups.(X²=1.1; p>0.05) (Table 6).

(Table 5).Comparison between groups for first analgesic request

1 st analgesic req.	Group O		Group M		Group C	
	No.	%	No.	%	No.	%
1 hr.	6	30	0	0	0	0
2 hr.	11	55	0	0	0	0
3 hr.	3	15	14	70	15	75
4 hr.	0	0	6	30	5	25

X²=47.9 (p<0.05)

Table (6): Post-operative VAS for the studied groups

	Group O	Group M	Group C
1 st hr.	2[2-3]	1[1-2]	2[1-2]
2 nd hr.	5(4-6)	3[3-4]	4[3-4]
3 rd hr.	6[6-7]	4[5-7]	6[5-7]
4 th hr.	4[3-6]	4[2-5]	3[2-5]
5 th hr.	4[2-5]	4[2-5]	4[2-5]
6 th hr.	4[2-5]	4[2-5]	4[2-5]

$$X^2=1.1 (p>0.05)$$

Discussion:

The results of this study show that the addition of magnesium, a competitive NMDA antagonist, as adjuvant to local anesthetic in peribulbar eye block reduces time of onset. With addition of clonidine, centrally acting α_2 agonist prolongs the duration of block. No study using peribulbar magnesium sulphate as an adjunct to local anesthetic has been done till today. But many studies used epidural magnesium sulphate as adjunct to bupivacaine and found that magnesium sulfate enhance the onset of action of local anesthetic. Biliret al ^[9] showed that the addition of magnesium sulfate as adjuvant to epidural bupivacaine reduces time of onset and establishment of epidural block upto T₆ level. The result of the present study shows that peribulbar clonidine with local anesthetic produces prolongation of anesthesia and analgesia after peribulbar block, although there was no difference in the success rate of block and onset times. Various previous studies [10, 11, 12,13and14] on axillary plexus, intrathecal, epidural and retrobulbar block have shown that analgesia was prolonged by clonidine (40%–100%). Opinions differ on the onset times, quality of block, and incidence of side effects [11, 12, and

14]. In a dose-response study Buttner et al ^[11] found that 120 and 240 μg clonidine with local anesthetic produces a dose-dependent prolongation of anesthesia and analgesia after brachial plexus block, but had no effect on the onset time and quality of block. They also noticed sedation in most patients receiving clonidine. In another study Bernard and Macaire ^[13] also found a dose-dependent prolongation of analgesia when 30, 90, and 300 μg clonidine was added to 1% lidocaine for brachial plexus block. Also Mjehed et al ^[12] reported a significant increase in duration of analgesia and akinesia after administration of 2 $\mu\text{g}/\text{kg}$ clonidine with 2% lidocaine for retrobulbar block. However, in a study for peribulbar block Connelly et al. ^[15] did not find any significant effect of 100 μg clonidine added to lidocaine on the onset of akinesia, sedation, perioperative analgesic requirement, and satisfaction score. They did not study the duration of block.

Conclusion: Co-administration of peribulbar magnesium local anesthetic produces predictable rapid onset of anesthesia without any side-effects, and addition of clonidine to local anesthetic produces prolonged duration of anesthesia.

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