

Peribulbar Block Using Dexmedetomidine versus Magnesium Sulphate as Additives to Local Anesthetics for Cataract Surgery

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ABSTRACT

Background: peribulbar block is commonly used for cataract surgery in adults, most commonly local anesthetics were injected into peribulbar space, but using only local anesthetics for peribulbar anesthesia is associated with delayed onset of globe akinesia and, short duration of analgesia and frequent need of block supplementation

Objective: to assess the efficacy and safety of addition of dexmedetomidine versus magnesium sulphate to local anesthetic mixture for peribulbar block in cataract surgery.

Patients and Methods: the patients were divided randomly into two equal groups: Dexmedetomidine group (**D Group**) included 30 patients who received 50 µg dexmedetomidine adjuvant to local anesthetics mixture (lidocaine and bupivacaine). Magnesium sulphate group (**M Group**) included 30 patients who received 50mg of Magnesium sulphate adjuvant to local anesthetics mixture (lidocaine and bupivacaine).

Results: The addition of Dexmedetomidine or Magnesium sulphate to local anesthetic in cataract surgery accelerates the onset of corneal anesthesia and globe akinesia. The decrease in the IOP is more in D Group. No significant changes in the hemodynamic measurements in both groups

Conclusion: Use of 50ug dexmedetomidine or 50mg magnesium sulphate 10% with mixture of lidocaine 2% plus bupivacaine 0.5% for peribulbar anesthesia in cataract surgery enhances the onset of globe anesthesia and akinesia. Dexmedetomidine causes more decrease in intraocular pressure magnesium sulphate.

Keywords: Dexmedetomidine – Magnesium sulphate - Peri bulbar block.

INTRODUCTION

local anesthesia is the best method for eye surgeries especially is old patients with systemic disease who are more liable for complications of anesthesia. Retro bulbar technique provides adequate anesthesia, decrease in intraocular pressure, akinesia and post operative analgesia.⁽¹⁾ But it has many complications as globe perforation, retro bulbar hemorrhage and brain stem anesthesia⁽²⁾. Peribulbar block with local anesthetics is commonly used for cataract surgery in adults but using only local anesthetics for peribulbar anesthesia is associated with delayed onset of globe akinesia and, short duration of analgesia and frequent need of block supplementation. To decrease the time of onset of action and increase the duration of analgesia, many additives such as hyaluronidase, sodium bicarbonate, adrenaline, corticosteroids and opioids were added to local anesthetics with limited success^(3,4,5). Until now no adjuvant is considered superior than others in prevention of local anesthetic complications like dryness of mouth, bradycardia, and allergic reaction⁽⁶⁾. Magnesium sulphate (MgSo₄) is a non-competitive Nmethyl-D-Aspartate [NMDA] antagonist and calcium channel blocker⁽⁷⁾, it has been used as additive to LA solution to hasten the onset time of block and prolong the duration of the anesthesia⁽⁸⁾. Dexmedetomidine is a selective agonist that have an eight fold greater affinity for α_2 adrenergic receptors (hypnotic and analgesic effect) than clonidine. It accelerates central and peripheral neural blockade when added to LA^(9,10). The aim of

this study is to compare the safety and efficacy of the addition of dexmedetomidine or magnesium to mixture of local anesthetics in cataract surgery by measuring onset of globe akinesia, corneal anesthesia and adequate time for surgery, Intraocular pressure and hemodynamic parameters (**primary outcome**), first request of analgesia and patient and doctor satisfaction (**secondary outcome**).

PATIENTS AND METHODS

A prospective randomized, comparative non controlled clinical study was carried out at Al-Zahraa university hospital between June 2017 to August 2018. **The study protocol adhered to the tenets of declaration of Helsinki and was approved by the ethics board of Al Azhar university.** An informed written consent was taken from each participant in the study.

The study included 60 patients physical stated ASA I or II of either sexes aged between 20 to 60 years scheduled for elective cataract surgery under peribulbar anesthesia.

In this study we excluded morbid obese patient with body mass index >35, patients with uncontrolled hypertension or diabetes, deafness, or with disturbed level of consciousness. Patients with axial eye length globe more than 25mm or with posterior staphyloma, patients on anticoagulant drugs were also excluded.

The patients were randomly allocated to one of two groups:

D group (Dexmedetomidine group) n=30: Each patient received 7ml combination of 3ml of lidocaine 2%, 3ml of bupivacaine 0.5% and 50ug of dexmedetomidine in 1ml saline 0.9%.

M group (Magnesium group) n=30: Each patient received 7ml combination of 3ml of lidocaine 2%, 3ml of bupivacaine 0.5% and 50mg of Magnesium sulphate in 1ml of saline 0.9%.

At the operating room, 22 or 20 gauge cannula was inserted in the dorsum of the non dominant hand and the patient were connected to (Nitton KoHden Corporation) monitor to record the heart rate(HR) and mean arterial blood pressure (MAP) and O₂ saturation. Anesthetic machine and resuscitative equipment's and drugs were checked. patients lies in natural position

Anesthetic technique : after sterilization of doctor hands and patient eye the topical anesthetic drops (Benoxinata HCL 0.4%) was conducted to patients eye. The injection was carried by using 26 guge, 13 mm. Short bevel needle connected to syringe contained with adjuvant according to patients group. The needle was introduced at two points, 3.5 ml of local anesthetic with adjuvant were injected in each point, after negative aspiration, The first injection is given inferiorly at the junction of outer one third and inner two third of the lower orbital rim(up to 5cc). The second injection is given superonasally beneath the superior orbital notch (3- 4 cc). Immediately following this injection gentle intermittent pressure is applied on the eye for 10-15 minutes.

Drugs used in the study:

- Benox.(epico Egypt) as topical anesthesia.
- Lidocaine 2% vail (Alex pharmaceutical)
- Bupivacaine 0.5% vial (sunny pharmaceutical Egypt).
- Magnesium sulphate 100 mg/mL ampule (Epicopharma Egypt)
- Dexmedetomidine 200ug/ 2ml (Hospira, USA)

Parameters of assessment

1. Corneal anesthesia was evaluated using cotton wick every 30 sec. till the onset of anesthesia.
2. Ocular movement was evaluated every 2.5 min. interval in all four directions using 3 points scale, 0 =complete akinesia, 1= limited akinesia, 2= normal movements. If a block is inadequate for more than 10 min additional injection of 3ml of local anesthetic solution was given at medial canthus.
3. Intraocular pressure IOP was measured 5 min before & 5 min after LA injection by Perkin's applanation tonometer .
4. Hemodynamic parameters; mean arterial blood pressure (MAP)& heart rate (HR) were recorded every 5min.
5. Adequate time for operations defined as the presence of corneal anesthesia together with an ocular movement ≤ 1 in all directions and eye lid akinesia score 0
6. Injection of supplementary of LA 10 min doses after injection.
7. Surgeon's and patients' satisfaction using verbal rating scale; from 0= total dis-satisfaction to 10=total satisfaction.
8. First request of analgesia.
9. Complications during and after block as nausea, vomiting, convulsion, allergy and failed block.

Statistical design : All data were analyzed using SAS_ (release 6.12 for Windows). The collected data were revised, coded, tabulated using statistical package for social science (SPSS 15.01 for windows; SPSS Inc, Chicago, IL, 2001).

RESULTS

Demographic characteristics : included age, sex, ASA classification and duration of surgery are reported in table (1). There's was no statistically significant difference between the two studied groups.

Table (1): demographic characteristics as (mean \pm SD) for the studied groups

Variables	group D (n=30)		group M (n=30)		P value
Age(y)	52.1 \pm 8.9		55.2 \pm 7.4		0.148
Sex	n	%	n	%	0.426
Male	20	(66.7)	17	(56.7)	
Female	10	(33.3)	13	(43.3)	
Weight (kg)	91 \pm 11		87 \pm 16		0.264
ASA classification	n	%	n	%	0.436
ASA I	15	(50)	12	(40)	
ASA II	15	(50)	18	(60)	
Duration of surgery(min)	52 \pm 8		57 \pm 12		0.063

The onset of sensory block and globe akinesia were more rapid for group D but with no statistically significant difference . p-value were 0.324 for sensory block and 0.523 for globe akinesia (table 2).

Table (2): onset of sensory block (min)

	group D (n=30)	group M (n=30)	Test value	P-value
Onset time of sensory block (min)	2.05 ± 0.65	2.25 ± 0.89	0.994	0.324
Onset time of globe akinesia (min).	2.9 ± 1.1	3.1 ± 1.3	0.643	0.523

D Group had shorter adequate time for operation than M group without statistically significant difference between the two groups P value 0.267 (table 3).

Table (3): adequate time for operation.

	group D (n=30)	group M (n=30)	Test value	P-value
Adequate time for operation	6.7 ± 1.6	7.24 ± 2.1	1.120	0.267

The intraocular pressure 5 minutes after block were lower for D group than M group and the difference were statistically highly significant p value 0.001 (table 4).

Table (4): intraocular pressure (IOP)

	Group D (n=30)	Group M (n=30)	Test value	P-value
IOP 5 min before block	14.7 ± 1.2	15.4 ± 1.5	1.996	0.051
IOP 5 min after block	12.3 ± 1.4	14.6 ± 1.6	5.925	0.001

Only 2(6.7%) patients in group D received supplementary dose of anesthesia while the number of patients were 9 (30.0%) in group M . this difference was statistically significant p value 0.019 (table 5).

Table (5): Supplementary doses of injection

	Group D	Group M	Test value	P-value
No need	28 (93.3%)	21 (70.0%)	5.455	0.019
Need	2 (6.7%)	9		

There were statistically no significant difference between the 2 groups regarding the changes in the heart rate (Fig. 1) and Mean arterial blood pressure (Fig. 2) .

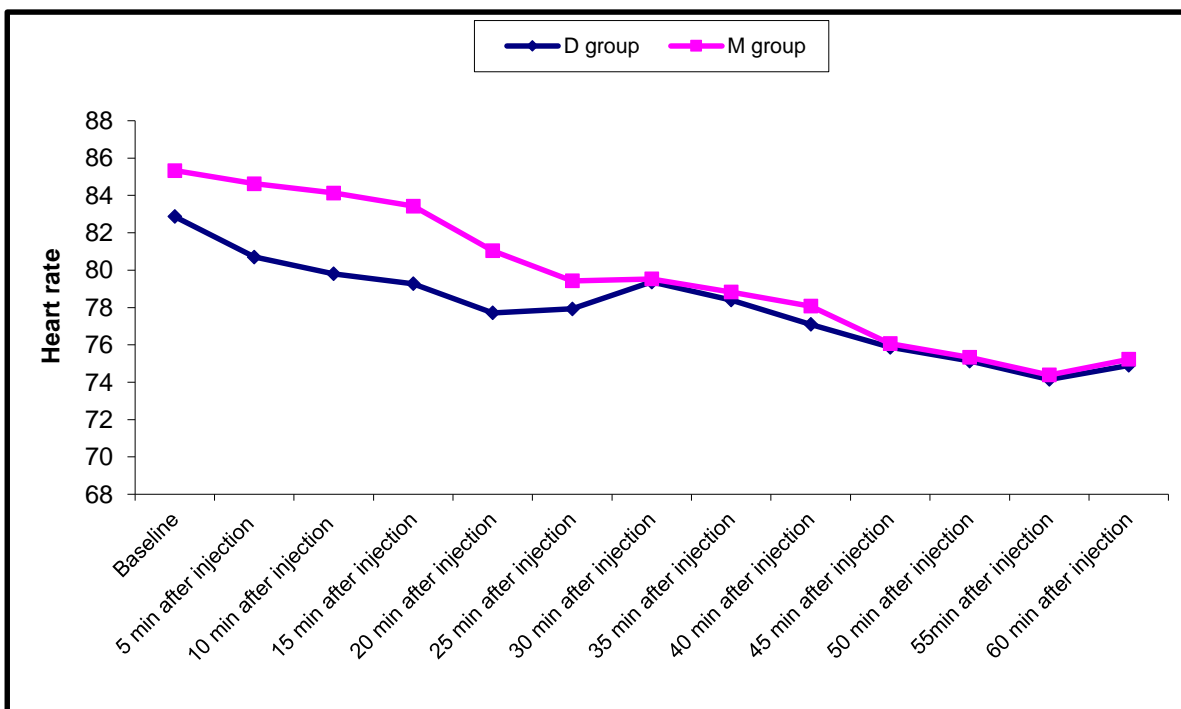


Fig. (1) HR changes in the two studied groups.

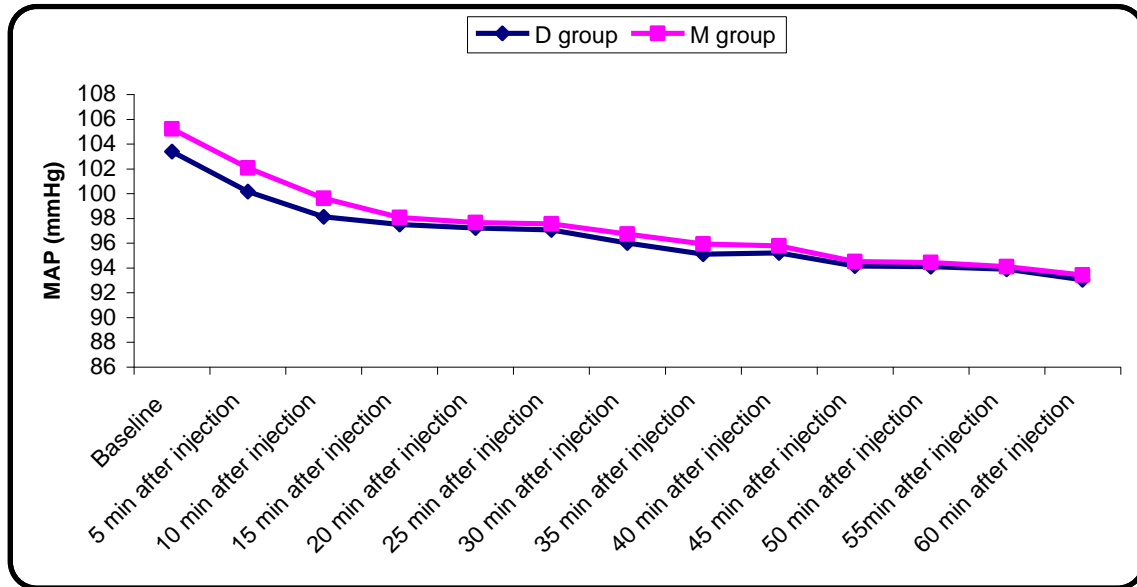


Fig. (2): MAP changes in the two studied groups.

As regard patients and surgeon’s satisfaction there were no statistically significant difference between the two groups. P value was 0.577 for patient satisfaction and 0.111 for surgeons (table 6).

	D group	M group	Test value	P-value
Numbers of patients with complete satisfaction	25 (83.3%)	27 (90.0%)	0.577	0.447
Numbers of surgeon’s with perfect satisfaction	25 (83.3%)	24 (80.0%)	0.111	0.739

Table (6) patients and surgeon’s satisfaction

The mean time for first analgesic request were 245 ± 25.0 min for D group and 239 ± 31.5 for M group with statistically no significant difference between the two groups.

As regard the complications during and after peribulbar anesthesia, there were no complications detected in the two groups.

DISCUSSION

Many authors studied the effect of addition different additives to local anesthetic mixture to improve the quality of ophthalmic block with different results ⁽¹¹⁾.

This study revealed that addition of 50 ug dexmedetomidine or 50mg magnesium sulphate to mixture of LA (lidocaine 2% plus bupivacaine 0.5%) in peribulbar anesthesia for cataract surgery enhance the onset time of sensory block, globe akinesia , time for start surgery and increase the time for first request of analgesia with little effect on hemodynamic also increase the patients and doctors satisfaction and improve the quality of operative conditions without marked complications.

The results of this study go with other authors ⁽¹²⁾ who found that the addition of different doses of dexmedetomidine 25 ug or 50 ug to local anesthetic mixture in cataract surgery enhances the onset of peribulbar anesthesia, prolongs the duration and increase time of postoperative analgesia, also found the addition of 50ug dexmedetomidine to local anesthetic mixture produces more sedation and patients satisfaction.

The results of present study supported with Hafez et al ⁽¹³⁾ , who examined the effect of addition different doses of dexmetetomidine (15 ug, 25ug and 50 ug) to local anesthetic mixture for peripbulbar anesthesia in vitreoretinal operations and found that dexmedetomidine accelerated the onset of sensory and motor block and increased the analgesic time. The results of this study is in line with the results of Abdelhamid ⁽¹⁴⁾ who found the addition of magnesium to LA mixture in peribulbar anesthesia accelerate the sensory and motor block in cataract surgery without any side hazards.

Also *Osama et al.* ⁽¹⁵⁾ found that addition of 15ug dexmetetomidine or 50 mg magnesium sulphate 10% to local anesthesia mixture of (Xylocaine 2% plus bupivacaine 0.5%) in the cataract operations accelerated the corneal anesthesia, akinesia and prolonged the duration of anesthesia and analgesia and improve the quality of the operative condition.

On the other hand other authors ⁽¹⁶⁾ found that adding 50mg magnesium sulphate to mixture of lidocaine 2% and bupivacaine0.5% had no effect on the onset of peribulbar block or akinesia score.

Regarding intraocular pressure measurement. This study is in line with other authors^(9,14) who reported that addition of dexmedetomidine to local anesthesia mixture of xylocaine 2% and bupivacaine 0.5% led to significant decrease of intraocular pressure.

The results of this study coincide with that done by **El Kabarity and Khashaba**⁽¹⁷⁾ on patients scheduled for elective vitreoretinal surgery. They found adding dexmedetomidine to mixture of LA significantly accelerated the onset of sensory and motor block and prolonged duration of lid and globe akinesia.

As regard of hemodynamic (MAP and HR) **Tripathi et al.**⁽¹⁸⁾ found that adding of α_2 agonist to bupivacaine in supraclavicular brachial plexus block, give more hemodynamic stability. Also other authors⁽¹⁴⁾ demonstrated that adding of dexmedetomidine to local anesthesia provide satisfactory level of hemodynamic stability with intraoperative sedation in peribulbar block. Regarding to side effect, this study is in line with Shivakumar et al⁽⁹⁾ who found that the dexmedetomidine as adjuvant to local anesthetic mixture provides sedation without respiratory depression. The use of 50ug dexmedetomidine or 50mg magnesium sulphate 10% with mixture of lidocaine 2% plus bupivacaine 0.5% for peribulbar anesthesia in cataract surgery enhances the onset of globe anesthesia and akinesia, Prolonged the time to first analgesic request and increase the satisfaction of patients and surgeons and enhance the quality of the operative conditions. Dexmedetomidine causes more decrease in intraocular pressure than magnesium sulphate .

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