

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Peribulbar Anaesthesia : Effect Of Adding Rocuronium On Orbital Muscles Akinesia.

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ABSTRACT

Using local anesthesia alone in cataract surgery is not optimal regarding the onset and duration of globe and lid akinesia. We investigated whether adding rocuronium to local anesthetics in peribulbar block (PB) would improve orbital muscle akinesia. This is a prospective, randomized, and double blinded study. It was conducted on forty patients with ASA physical status I-III undergoing cataract surgery. Patients were randomly divided in two groups. Rocuronium group (n=20); was given local anesthetic mixture (4 ml of lidocaine 2% and hyaluronidase 30 IU/ml + 0.5 ml of 5 mg rocuronium) and control group (n=20); was given the same mixture with substitution of rocuronium with 0.5 ml saline. Globe and lid akinesia was assessed every 2 minutes for 10 minutes and complication was monitored. Rocuronium group showed significantly better globe and lid akinesia than control group. The need of supplementary injection was significantly decreased in rocuronium group. With exception of chemosis, which occurred in both patients' groups, no other complications had occurred. Addition of 5mg of rocuronium to local anesthetic mixture used in PB improves the quality of akinesia

Keywords: Peribulbar block, regional anesthesia, neuromuscular blockage, rocuronium, local anesthetics.

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INTRODUCTION

Local anesthesia is widely used in ophthalmic surgery. The safest technique is peribulbar block (PB) which is considered optimal in cataract surgery (**Ripart et al, 2001**). However, PB is associated with limited diffusion of local anesthesia, delayed and/ or incomplete orbital akinesia (**Wong, 1993**), with subsequent supplementary injection, risk of globe perforation and retrobulbar hemorrhage (**Loots et al, 1993**).

Many adjuvants have been added to local anesthetic mixture to reduce PB complications. Hyaluronidase has been added to improve tissue diffusion (**Barioni et al, 2002**). Other studies have suggested the use of low dose neuromuscular blockers; vecuronium (**Reah et al, 1998**) and atracurium (**Kucukyavuz and Arici, 2002**) to improve akinesia. However, histamine releasing property of these drugs resulted in undesirable hyperemia. Rocuronium is a long acting muscle relaxant that is devoid of histamine releasing property (**Messaha et al, 2015**).

The aim of this study was to investigate the effect of adding rocuronium to local anesthesia mixture of PB in improving globe and lid akinesia of patients undergoing cataract surgery.

SUBJECTS AND METHODS

This is a prospective, randomized, double blinded study. It was conducted in Anesthesiology Department, Zagazig University Hospitals, Egypt. The approval of the institution's local ethics committee was obtained and informed consent was signed by patients. The study included forty patients of American Society of Anesthesiologist (ASA) I-III, aged from 40 to 67 years. They were admitted to undergo elective cataract surgery (manual extra capsular extraction) under PB anesthesia.

Patients who had abnormal bleeding profile, allergy to local anesthesia drugs, lid abnormalities, mental retardation, axial length more than 26 mm or neuromuscular disease, were excluded from the study.

Patients were randomly allocated into two groups; rocuronium group (n=20) received 4ml local anesthetic mixture to which was added 5mg rocuronium (0.5ml), and control group (n=20) received the same mixture to which was added 0.5ml saline. The local anesthetic mixture used was consisted of 4ml of lidocaine 2% and 30 IU/ml hyaluronidase. The injected volume was not fixed in all patients but it was continued till lid and orbital fullness occurred. The anesthetist who performed the PB received unlabelled syringe and was not aware of local anesthetic mixture.

In operating room, anesthesiologist inserted I.V. catheter. Monitoring was done using ECG, NIBP and pulse oximeter. Movement of the globe in 4 directions of gaze (superior, inferior, medial, lateral) was assessed before performing the block, then topical anesthesia was applied by administering 2-3 drops of benoxinate hydrochloride 0.4%. 20 µg fentanyl was injected intravenously before performing the block.

The block was performed percutaneously in the inferior margin of the orbit in the same line with inferior lacrimal canaliculus using 25-gauge, short bevel needle, which was advanced in an anteroposterior direction for half its length then obliquely in the direction of orbital foramen as described by **Rizzo et al. (2005)**. Evaluation of sensory block was done by pinprick test at the conjunctiva.

Patients were evaluated for eyelid and globe akinesia every 2 minutes for 10 minutes after the block using Brahma score (**Brahma et al., 1994**) as following; patients was asked to squeeze the eyelid while it was opened by doctor's hand (no movement = 0, flickering = 1, free movement = 2), globe movement was scored for each direction of gaze with total sum of 12 (no movement =0, flickering =1, moderate movement =2, full movement =3). Globe akinesia score of 3 or less was defined as successful block.

If the block was inadequate (presence of any sensation, total inability to squeeze eyelid or globe movement score more than 3) after 10 min, supplementary dose of 3ml lidocaine 2% in the same infrotemporal region was injected.

Pain during post-operative period (2 hours after operation) was evaluated by visual analogue (VAS) score from 0 to 10 (no pain=0, the worst pain possible=10). Patients and surgeons satisfaction were assessed by satisfaction score (total dissatisfaction=1, excellent satisfaction =4).

Statistical analysis

Sample size was calculated with 80% statistical power and 95% confidence level. The distribution of quantitative variables was assessed using kolmogorov-Smirnov test. Qualitative variables were presented as number (percent) and analyzed using chi-square test. Normally distributed quantitative variable were presented as mean± standard deviation (SD) and compared using student t and One Way ANOVA for repeated measures. Nonparametric quantitative variables were presented as median and interquartile range and analyzed using Mann Whitney test. P value < 0.05 is considered to be statistically significant. Statistical analysis was performed using Statistical Package for Social Science version 17.0 for Microsoft Windows (SPSS Inc., Chicago, IL, USA).

RESULTS

The patients' demographic data were not significantly different between the studied groups. The need for supplementary injection was significantly decreased in rocuronium group compared to control group. No significant difference in pain score (VAS score) were found in postoperative period. Surgeon's satisfaction scores were significantly better in rocuronium group than control group (table 1).

There were significant decrease in globe and lid akinesia in rocuronium group compared to control group at 2, 4, 6, 8 and 10 minutes. In addition, globe and lid akinesia in each group were significantly decreased over time (table 2, 3, figure 1).

As regard complications, chemosis occurred in 3 (15%) patients in rocuronium group and 6 (30%) patients in control group with no statistical significant difference between the two groups (p=0.45). No muscle weakness or respiratory distress had occurred in all patients. We monitored neuromuscular function in patients receiving rocuronium, and no change in Train of Four (TOF) ratio occurred. Ocular motility were examined 24 hours post operative , no residual orbital muscle akinesia were found.

Table 1: Patients' characteristics

	Control group (n=20)	Rocuronium group (n=20)	P
*Age (years)	55.05± 6.99	56.1±7.4	0.64
Sex (M/F)	10/10 (50/50)	10/10 (50/50)	1.0
ASA physical status (I/II/III)	10/9/4 (50/45/15)	9/7/4 (45/35/20)	0.901
*Axial length (mm)	22.45± 3.1	21.75± 2.59	0.44
Patients requiring supplementary injection	10 (50)	1 (5)	0.001
**VAS score	2 (1-5)	2 (0-5)	0.83
Surgeon satisfaction (Good /Excellent)	20/0 (75/25)	2/18 (10/90)	<0.001

N: number of subjects.

Data are presented as number (%),*mean ±SD and **median (range).

P< 0.05 is significant.

Table 2: Comparison of globe akinesia at different times between both groups:

Globe akinesia (minutes)	Control group (n=20)	Rocuronium group (n=20)	P
2	7 (5 – 9)	5.5 (3 – 9)	0.006
4	3.5 (2 – 7)	2 (1 – 6)	<0.001

6	2.5 (1 – 6)	1 (0 – 6)	0.001
8	2 (0 – 5)	0 (0 – 5)	<0.001
10	1 (0 – 5)	0 (0 – 4)	<0.001
P	<0.001	<0.001	

N: number of subjects.

Data are presented as median (range).

P< 0.05 is significant.

Table 3: Comparison of lid akinesia at different times between both groups:

Lid akinesia (minutes)	Control group (n=20)	Rocuronium group (n=20)	P
2	2 (1 – 3)	1 (1 – 2)	<0.001
4	2 (1 – 2)	1 (0 – 1)	<0.001
6	1 (1 – 2)	0 (0 – 1)	<0.001
8	1 (1)	0 (0 – 1)	<0.001
10	1 (0 – 1)	0 (0 – 1)	<0.001
P	<0.001	<0.001	

N: number of subjects.

Data are presented as median (range).

P< 0.05 is significant.

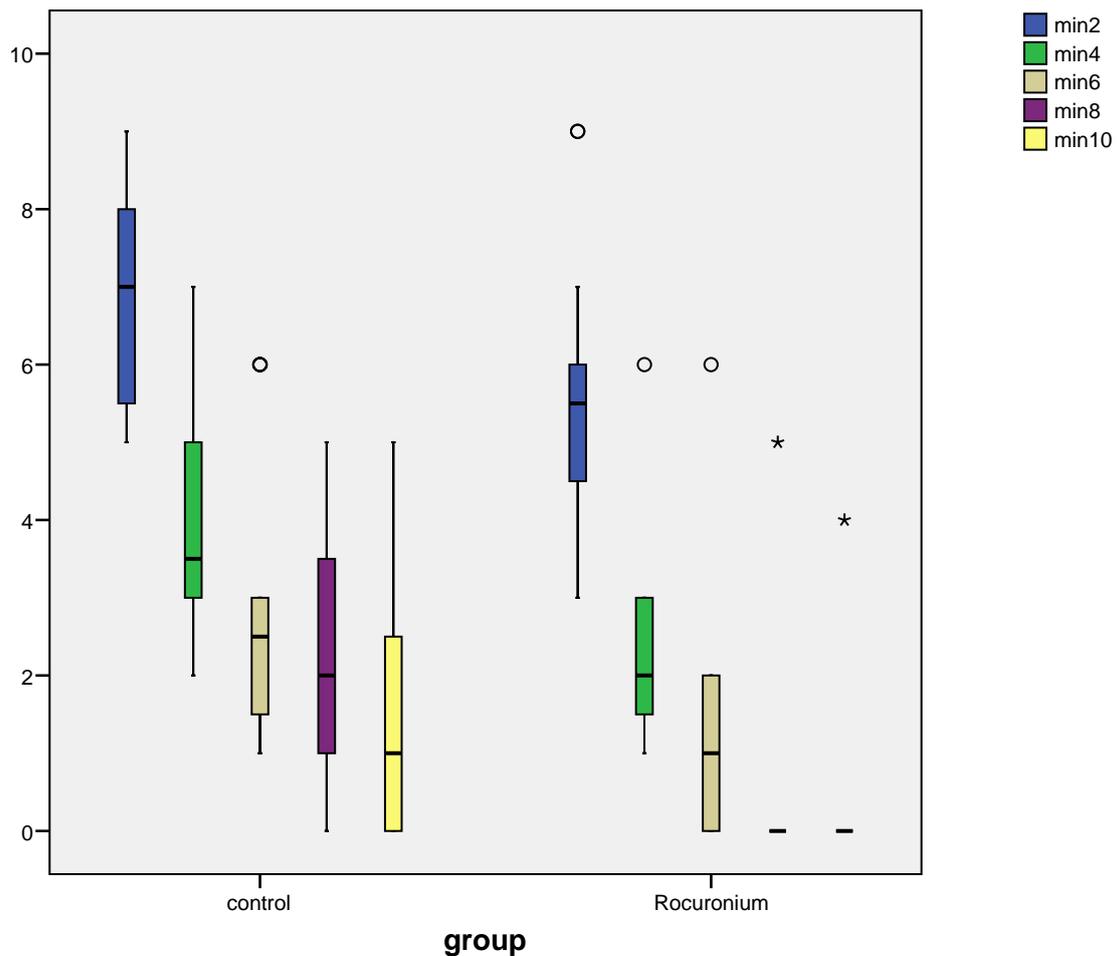


Figure 1: boxplot showing globe akinesia score over time in the two studied groups.

DISCUSSION

Many adjuvants are used to improve the quality of PB (**Guise and Laurent, 1999& Barioni et al, 2002&Bharti et al, 2002**). Muscle relaxants have been added to improve akinesia (**Kucukyavuz and Arici, 2002**). We evaluated the effect of adding rocuronium to local anesthesia of BP on globe and lid akinesia, the need of supplementary injection and the occurrence of complications.

The rocuronium group in our study demonstrated statistically significant decreased globe and lid akinesia score versus control group, better surgeon satisfaction, lesser need for supplementary injection. Although chemosis occurred less frequently in rocuronium group, it didn't reach statistical significant difference.

The results of globe akinesia obtained from our study are corresponding to that of **Aissaoui et al. (2010)** who reported adding 0.06 mg/kg of rocuronium to a local anesthetic mixture (lidocaine 2%, bupivacaine 0.5%) in peribulbar block demonstrated significantly better akinesia than control group. However, they did not add hyaluronidase to the local anesthetic mixture. The use of hyaluronidase has been documented in ophthalmic surgery to fasten the onset and improving the quality of peribulbar block (**Messeha and Elhesy, 2015**).

In our study, no difference in pain score was noted between the two groups. The addition of neuromuscular blockers to local anesthetics does not affect analgesia because they affect only motor nerves (**Rizzo et al., 2005**). They induce akinesia in extraocular muscles so optimizing the sitting for ophthalmic surgeries.

The mechanism by which non depolarizing muscle relaxants improve lid and globe akinesia is not clear. They could have local effect on motor endplate to block muscle spindle activity. As a result, muscle tone and spasm decrease (**Sztark et al, 1997**).

Our results regarding quality of eye akinesia were agreed by **Reah et al. (1998)** who added a dose of 0.5 mg of vecuronium to a mixture of bupivacaine-lidocaine and 15 IU/ml of hyaluronidase. They found that vecuronium improved the quality of globe and lid akinesia without side effects. **Eghbal et al. (2010)** concluded that muscle relaxant, atracurium, as adjuvant shortened the onset period of retrobulbar block akinesia, prolonged its duration, and provide excellent surgical conditions without any specific complications.

There is a potential risk for intravenous injection or systemic resorption of neuromuscular blocker that may cause generalized muscle weakness. A case was reported where vecuronium was mixed with bupivacaine and lidocaine (**Allan, 2001**). However, the author injected 2mg of vecuronium which was four times higher than recommended (**Reah et al, 1998**). In our study, we monitored TOF ratio in rocuronium group and there was no change of neuromuscular function.

In conclusion, addition of 5mg rocuronium to lidocaine 2% and hyaluronidase for peribulbar block is a safe and effective method in improving quality of globe and lid akinesia with better surgeon satisfaction and less need for supplementary injection.

REFERENCES

- [1] Ripart J, Lefrant JY, de La coussaye JE et al. Peribulbar versus retrobulbar anesthesia for ophthalmic surgery: an anatomical comparison of extraconal and intraconal injections. *Anesthesiology* 2001; 94: 56-62.
- [2] Wong DH. Regional anesthesia for intraocular surgery. *Can J Anesth* 1993; 40: 635-657.
- [3] Loots JH, Koorts AS, Venter JA. Peribulbar anesthesia. A prospective statistical analysis of the efficacy and predictability of bupivacaine and lignocaine\bupivacaine mixture. *J Cataract Refract Surg* 1993; 19:72-76.
- [4] Barioni MFG, Lauretti GR, Lauretti-Fo A, Pereira NL. Clonidine as coadjuvant in eye surgery: comparison of peribulbar versus oral administration. *J. Clin Anesth* 2002; 14:140-145.
- [5] Reah G, Bodenham AR, Braithwaite, Esmond J et al. Peribulbar anesthesia using a mixture of local anaesthesia and vecuronium. *Anesthesia* 1998; 53:551-554.

- [6] Kucukyavuz Z and Arici MK. Effects of atracurium added to local anesthetics on akinesia in peribulbar block. *Reg Anesth Pain Med* 2002; 27: 487-490.
- [7] Messeha MM and Elhesy AE. Comparison of orbital muscle akinesia caused by rocuronium versus hyaluronidase mixed to the local anesthetic in single injection peribulbar block for cataract surgery. *Anesth Essays Res* 2015; 9: 374-378.
- [8] Rizzo L, Marini M, Rosati C et al. Peribulbar anesthesia: a percutaneous single injection technique with a small volume of anesthetic. *Anesth Analg* 2005; 100: 94–96.
- [9] Brahama AK, Pemberton CJ and Ayeko M and Morgan LH. Single medial injection peribulbar anesthesia using prilocaine. *Anesthesia* 1994; 49(11): 1003– 1005.
- [10] Guise P and Laurent S. Sub-tenon block: the effect of hyaluronidase on speed of onset and block quality. *Anesth Intensive Care* 1999; 27:179-181.
- [11] Bharti N, Madan R Kaul HL et al. Effect of addition of clonidine to local anesthetic mixture for peribulbar block. *Anesth Intensive Care* 2002; 30:438–441.
- [12] Aissaoui Y, Belyamani L and Drissi Kamili N. Effect of the addition of rocuronium to local anesthetics for peribulbar block. *Acta Anaesth Belg* 2010; 61:51-54.
- [13] Sztark F, Thicoipe M et al. The use of 0.25% lidocaine with fentanyl and pancurium for intravenous regional anaesthesia. *Anesthesia and Analgesia* 1997; 84 (4):777-779.
- [14] Eghbal MH, Hesam T, Shoja AT and Mohammad RR. The effect of addition of low dose rocuronium to local anesthetic in retrobulbar block for cataract surgery. *Middle East J Anesthesiol* 2010 ;20(4):535-538.
- [15] Allan TWB. Systemic spread of vecuronium following use in peribulbar regional anaesthesia. *Anaesthesia* 2001; 56: 1018.