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Research Article

# Adding low dose rocuronium to local anesthetic mixture: Effect on quality of peribulbar blockade for vitreoretinal surgery

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**KEYWORDS**

Rocuronium;
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**Abstract** *Background:* The purpose of this study was to assess the effect of adding low dose rocuronium to local anesthetic solution on the quality of peribulbar blockade for vitreoretinal (VR) surgery.
*Methods:* 80 consecutive adult patients scheduled for VR surgery were enrolled in this double-blind randomized clinical trial. Patients were categorized randomly into 2 equal groups: group C (control group) received local anesthetic mixture (4 ml lidocaine 2%, 4 ml bupivacaine 0.5%, and hyaluronidase "30 U/ml") plus 0.5 ml normal saline, and group S (study group) received the same local anesthetic mixture plus 5 mg (0.5 ml) rocuronium. Globe and lid akinesia were assessed 15 min after injection, and supplemental peribulbar blockade was done in case of inadequate analgesia and or akinesia. Intraoperatively, supplementary sub-Tenon infiltration was performed in case of inadequate analgesia and/or akinesia. Measurement data included rate of supplementation, analgesic efficacy, time to first sub-Tenon infiltration, and total anesthetic volume. Major complications, and patient's and surgeon's satisfaction were also recorded.
*Results:* The adequacy of peribulbar blockade 15 min after injection was comparable in both groups. Rate of supplementary sub-Tenon infiltration was lower in the rocuronium group which is statistically significant (15 injections versus 53 injections in the control group). Time to first sub-Tenon infiltration was significantly prolonged in the rocuronium group (90.4 + 11.8 versus 60.2 + 9.2 in the control group). The total anesthetic volume injected was significantly lower in the rocuronium group (13.2 + 0.6 versus 20.6 + 0.8 in the control group). There were no major systemic or local complications in both groups. Patient's and surgeon's satisfaction was significantly higher in the rocuronium group.
*Conclusion:* Adding low dose rocuronium to local anesthetics prolongs duration of peribulbar anesthesia and offers an optimal surgical condition without serious adverse effects for patients undergoing VR surgery.


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## 1. Introduction

Peribulbar blockade has been widely performed for anterior segment surgery as it provides the same effect as retrobulbar anesthesia, but with a lower complications rate [1]. On the other hand, the lengthy VR surgery that has un-predictable and uncomfortable nature often necessitates general anesthesia; however, there are many trials proved the safety and efficacy of local anesthesia in this type of surgery [2–4].

Previous studies demonstrated that ophthalmic procedures more than 2 h duration needed an anesthetic adjuvant and cannot be performed using the mere standard anesthetics [5,6]; moreover, it may be necessary to add two adjuvants to prolong the duration of local anesthetics [7]. Extending the duration for LA has been also achieved by supplementary sub-Tenon's infiltration or indwelling catheter technique in other studies [8–10].

The efficacy of adding neuromuscular blockers to the standard LA for anterior segment surgery performed under peribulbar block has been previously studied [11–15]. To the best of our knowledge, there were no trials studied the use of neuromuscular blockers as an adjuvant to the peribulbar blockade for VR surgery. We hypothesis that, for VR surgery, adding low dose neuromuscular blocker to the peribulbar LA solutions may prolong duration, optimize both globe and lid akinesia and analgesia, and may limit intraoperative sub-Tenon supplementation.

## 2. Patient and methods

After obtaining the approval of the local ethical committee, and Informed written consent from each patient, 80 adult patients scheduled for VR surgery in Zagazig University Hospitals of either sex from the beginning of June 2013 to the end of May 2014 were included in this prospective double-blind randomized clinical trial. Exclusion criteria included patients younger than 18 years, patients who refused local anesthesia, those with single eye, ocular infection, and when the decubitus position was impossible. Patients with communication problems, coagulopathy, impaired consciousness, and mental retardation, were also excluded from the study.

Preoperative investigations in the form of electrocardiography (ECG), complete blood picture (CBC), coagulation profile, liver function, kidney function, and biometry were done for every patient. All patients received no premedications.

In the anesthetic room, an intravenous line was inserted, basic monitors were applied (5-lead ECG, pulse oximeter, automated non-invasive blood pressure "NIBP"), and a nasal cannula 2 L/min was attached. Monitoring and oxygen therapy were continued for all patients throughout the procedure. Topical anesthesia of the conjunctiva and cornea was provided by administering 2–3 drops of Benoxinate hydrochloride 0.4%. Titrated doses of Midazolam 0.5 mg and/or 20 uq fentanyl were administered 5 min before peribulbar injection with a target to keep the patient calm and cooperative.

Participants were randomly allocated using a closed envelope into two equal groups according to the type of the test drug: group C (control group) received a local anesthetic mixture (4 ml lidocaine 2%, 4 ml bupivacaine 0.5%, and hyaluronidase "30 U/ml") plus 0.5 ml normal saline, and group S (study group) received the same standard local anesthetic mixture (4 ml lidocaine 2%, 4 ml bupivacaine 0.5%, and hyaluronidase "30 U/ml") plus 5 mg (0.5 ml) rocuronium.

The LA solution used for each patient was revealed by opening sealing envelopes, and then prepared by the same nurse anesthetist who drew up the LA mixture and provided an unlabelled syringe to the same anesthetist who performed all blocks and were unaware of the LA nature.

After sterilization, the solution study was injected after negative aspiration using a 27 G 16 mm needle according to the injection site described by Rizzo et al. [16], percutaneous and limited superiorly from the inferior lacrimal canaliculus, median from lateral margin of the nose, laterally from imaginary perpendicular line that joins the inferior lacrimal papilla to the inferior margin of the orbit and inferiorly from the inferior margin of the orbit. The needle was advanced percutaneously in an anteroposterior direction for half of its length (never more than 10 ml) and later obliquely in the direction of the orbital foramen. End points of injection were proptosis, fullness of the upper eyelid, or when the globe became subjectively tense. As soon as the globe became soft, the injection was started again until the globe becomes tense again. A gentle digital massage of the eyeball was done for one minute followed by application of a Hanon balloon inflated to 30 $mmH_2O$ for 15 min.

After removing the balloon, analgesia, ocular and eyelid movements were evaluated by the same surgeon who was also blinded to the LA solution used. Analgesia was considered to be perfect when the patient did not notice any pain on holding bulbar conjunctiva and lateral rectus muscle insertion. Eyelid and globe akinesia were assessed by the scoring system described by Brahama et al. [17] (Table 1); Patients were asked to squeeze the eye while it is opened in by the surgeon's hand (score of 2 if eyelid moves freely, score of 1 if it is flickering only, and score of 0 if there is no movement). Globe movement was scored for each direction of gaze with a total sum of 12 (score of 3 = full movement, score of 2 = moderate movement, score of 1 = flicker movement, and score of 0 = no movement). If the block was inadequate (presence of any sensation, total inability to squeeze the eyelid, or globe movement score of 2 or more in any direction), a supplementary injection was performed via the same approach, using 3–6 ml of lidocaine 2%, and then, the Hanon balloon was reapplied again for 10 min. If eyelid or globe movements score still more than 2 in any direction, the block was considered to be failed.

If the patient experienced considerable pain and/or the eyelid and or globe akinesia was inadequate to a degree that disturbs the operating surgeon, a supplemental lidocaine 2%

**Table 1** Scoring system for degree of akinesia.

| | |
|---|---|
| *Ocular movement* | |
| Full movement | 3 |
| Moderate movement | 2 |
| Flicker | 1 |
| No movement | 0 |
| *Eyelid movement* | |
| Full movement | 2 |
| Flicker | 1 |
| No movement | 0 |