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Research article

Ketamine versus fentanyl as an adjuvant to local anesthetics in the peribulbar block for vitreoretinal surgeries: Randomized controlled study

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ABSTRACT

Background: The use of an adjuvant to local anesthetics in the peribulbar block may improve the block characteristics. This study aimed to evaluate the effect of the addition of either ketamine or fentanyl to local anesthetics in single injection peribulbar block on the quality of the block.

Methods: The study included ninety adult patients presented for vitreoretinal surgeries. Patients were randomly allocated into three groups. All patients received peribulbar block with a local anesthetic mixture composed of 4 ml lidocaine 2% containing hyaluronidase, and 5 ml of plain bupivacaine 0.5% with an addition of either 1 ml of normal saline, 30 μg fentanyl, or 25 mg ketamine in Control group, Fentanyl group, and Ketamine group respectively. The measurements included the onset and duration of both anesthesia and akinesia with evaluation of intraocular pressure, postoperative pain score and need of analgesics.

Results: As compared to control group, the use of either fentanyl or ketamine as local anesthetic adjuvant significantly fastened the onset of anesthesia (1.67 ± 1.21 min) (1.93 ± 1.36 min), prolonged the duration of lid akinesia (127.50 ± 22.20 min) (127.00 ± 22.19 min), increased the duration of globe akinesia (156.00 ± 28.02 min) (158.00 ± 31.18 min), minimized the time required to start surgery (6.57 ± 1.99 min) (6.57 ± 1.85 min), and increased the time for first request of postoperative analgesia (189.50 ± 34.92 min) (184.67 ± 35.37 min) ($P < .05$). However, neither fentanyl nor ketamine had a significant effect on the onset of lid or globe akinesia or the intraocular pressure ($P > .05$).

Conclusion: Fentanyl or ketamine can be used as a local anesthetic adjuvant in the peribulbar block in patients presented for vitreoretinal surgeries as both of them improved the quality of the block without increasing intraocular pressure.

1. Introduction

Regional anesthesia of the eye had gained greater popularity over general anesthesia in the ophthalmic surgeries as it becomes easier [1], associated with a lesser incidence of respiratory and hemodynamic depression, and associated with better postoperative analgesia [2]. Peribulbar block seems to be the best choice for ophthalmic surgeries [3]. The single injection peribulbar percutaneous block with the use of short needles was proved to be easy, simple, and less painful technique providing adequate analgesia and akinesia [4].

The use of regional anesthesia techniques for vitreoretinal surgeries seems to be difficult as they are longer surgeries with increased postoperative pain. Thus, prolongation of the duration of the peribulbar block through adding adjuvant to local anesthetics allows performing of vitreoretinal surgeries under regional anesthesia [5].

There are many available studies evaluating the addition of opioids especially fentanyl to the local anesthetics in many regional anesthetic techniques with an improvement of the quality of the block which may be due to binding to opioid receptors in the nerve ending [6]. Moreover, certain studies found that the use of dissociative intravenous anesthetic agent, Ketamine, as an adjuvant to local anesthetic drugs in certain regional anesthesia techniques improves the quality of block which was attributed to the abolishment of afferent noxious stimuli [7].

The main concern with the use of ketamine in ophthalmic anesthesia is its effect on the intraocular pressure [8]. Certain animal and human studies reported that ketamine use was associated with significant increase in the intraocular tension [9,10]. However, other studies suggested that ketamine has no or little effect on the intraocular pressure [11,12].

The aim of our study was to evaluate the effect of the use of fentanyl

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(30 μg) or ketamine (25 mg) as an adjuvant to a local anesthetic mixture in single injection peribulbar block for patients presented for vitreoretinal surgeries. Our primary outcome was the onset of globe akinesia, while, the secondary outcome was the duration of lid and globe akinesia.

2. Patients and methods

Firstly, The study was approved by the local ethics committee (Tanta Faculty of Medicine Research Ethics Committee 30472/08/2015) and registered on the Pan African Clinical Trial Registry with an identification number of PACTR201602001406377. This prospective, controlled, randomized, double-blinded study was carried out in The Ophthalmology Department of Tanta University Hospital on adult patients of both gender, aged from 45 up to 65 years, ASA class I or II, admitted for vitreoretinal surgeries. The study lasted for a duration of one year starting immediately after ethical committee approval (October 2015-October 2016). Patients were assessed preoperatively in the anesthesia clinic with an explanation of the purpose and the technique of the research, then an informed written consent was obtained from all patients. All the given data was kept in a secret manner and used for current medical research only. All the studied patients and participating investigators were blinded to the used mixture of local anesthetics through the whole duration of the study.

Patients were excluded from the study if they refused to participate in the study, were unconscious or uncooperative, had glaucoma or ocular infection, suffered from coagulopathy, or had a recent history of myocardial infarction or uncontrolled blood pressure. Patients were distributed randomly into three equal groups (30 patients each; Fig. 1) using Computer generated randomization in opaque sealed envelopes to allow every patient to select the envelope of his group.

Local anesthetic solutions were prepared by an anesthesiologist resident who wasn't participating in the research in similar syringes for the three studied groups, each syringe contain 10 ml solution composed of 4 ml of lidocaine 2% containing 75 IU of hyaluronidase, and 5 ml of plain bupivacaine 0.5%, and 1 ml of normal saline in ***Control group (C)***, and the solution composed of 30 ug fentanyl (1 ml), 4 ml of lidocaine 2% containing 75 IU of hyaluronidase, and 5 ml of plain bupivacaine 0.5% in ***Fentanyl group (F)***, While, the solution was composed of 25 mg ketamine (1 ml), 4 ml of lidocaine 2% containing 75 IU of hyaluronidase, and 5 ml of plain bupivacaine 0.5% in ***Ketamine group (K)***.

Once, the patients were admitted to the operating room, an intravenous access was established using 20 gauge venous cannula, then, patients were attached to monitor of three leads ECG, noninvasive blood pressure, and pulse oximetry. The peribulbar block was performed with the use of 25 gauge 16 mm bevel disposable needles for all blocks with a limitation of injection site by inferior lacrimal canaliculus superiorly, inferior orbital margin inferiorly, lateral nasal margin medially, an imaginary line from the inferior orbital margin and inferior lacrimal papilla laterally [13]. Injection of 10 ml of previously prepared solution over a period of 30 s was done which was followed by a transient fullness of the upper and lower eye lids. Careful closure of the eye, padding and intermittent compression with the use of Honan

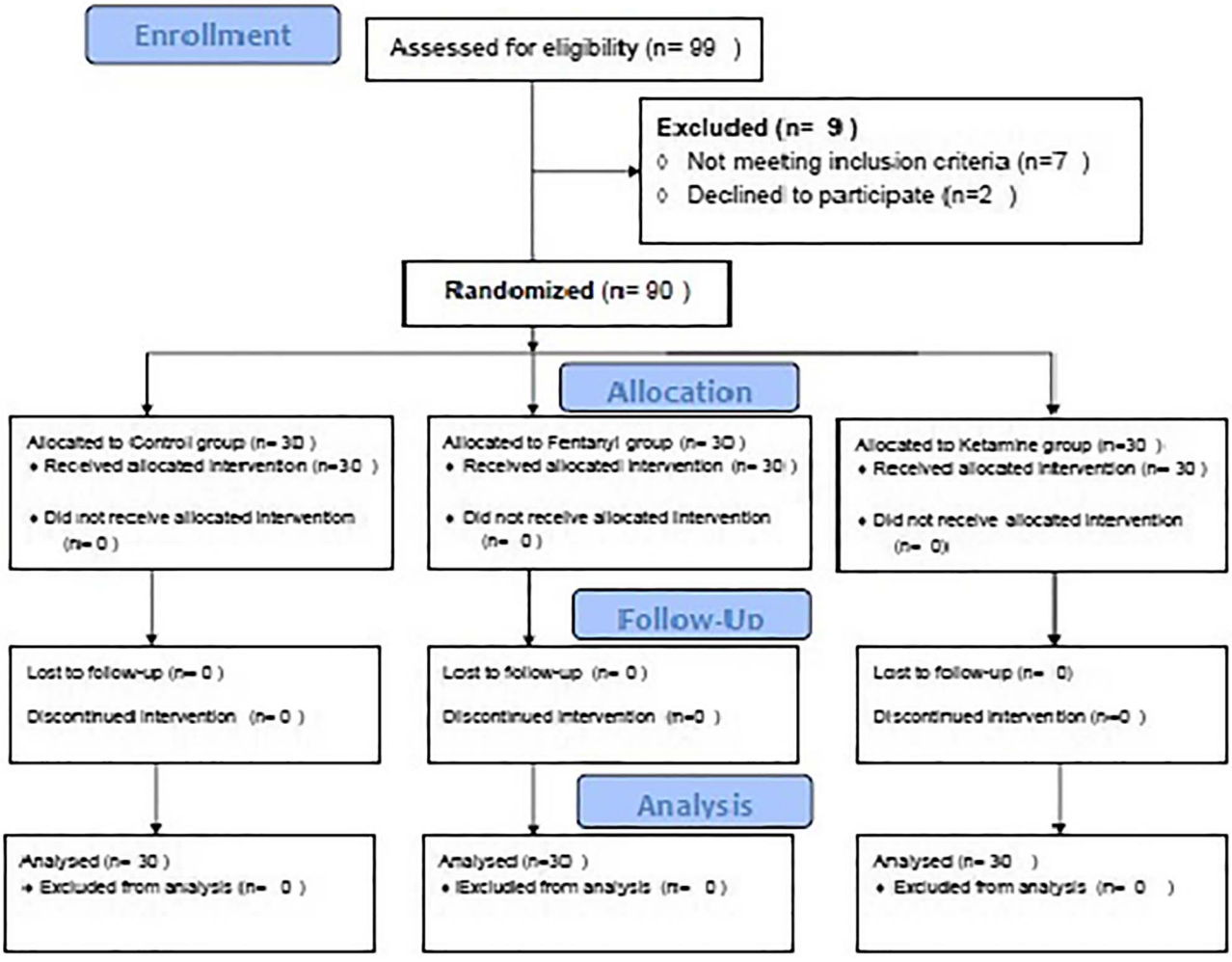

Fig. 1. CONSORT flow chart of the distribution of participating patients throughout each stage of the trial.