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Effect of the use of dexmedetomidine as an adjuvant in peribulbar anesthesia in patients presented for vitreoretinal surgeries

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ABSTRACT

Background: Dexmedetomidine, if used in combination with a local anesthetic mixture in peribulbar anesthesia, may alter the block characteristic. This research aimed to study the influence of adding dexmedetomidine to local anesthetics in the peribulbar block.

Methods: Sixty adult patients of both gender presented for vitreoretinal surgeries were enrolled in this prospective double-blinded study. They were randomly distributed into two equal groups. All the patients received peribulbar anesthesia with 10 ml mixture composed of 4 ml of plain bupivacaine 0.5%, 4 ml of lidocaine 2 % containing 50 IU hyaluronidase, and either 2 ml of normal saline (Control group) or 20 μg dexmedetomidine in (Dexmedetomidine group). The onset, the duration, and quality of sensory and motor blockade and the perioperative sedation were recorded.

Results: As compared to the control group, dexmedetomidine when added to a local anesthetics in peribulbar block, significantly decreased the onset of anesthesia to 2.40 ± 1.50 min, fastened the onset of the lid akinesia to 2.93 ± 2.07 min and globe akinesia to 2.87 ± 1.96 min, increased the duration of lid akinesia to 137.00 ± 17.94 min and globe akinesia to 166.50 ± 21.34 min, and increased the time of the first request for postoperative analgesia to 185.83 ± 30.80 min ($P < .05$). Also, it significantly increased the level of patients sedation ($P < .05$).

Conclusion: A small dose of dexmedetomidine added to a local anesthetic mixture in peribulbar block improved the sensory and motor block criteria with increased level of patients sedation.

1. Introduction

Ophthalmic surgeries belong to the group of low risk surgeries owing to decreased risk of blood loss and/or fluid shift even with prolongation of the surgery [1]. However, patients undergoing retinal surgeries are often suffering from multiple co-morbidities as diabetes mellitus, hypertension, or cardiac disorders. These co-morbidities increase the anesthetic risk especially with the use of general anesthesia technique [2]. Therefore, local anesthetic techniques of the eye as peribulbar, retrobulbar, and sub-Tenons block are largely used for ophthalmic surgeries in many large centers all over the world [3,4]. It have advantage of decreased perioperative risk, improves postoperative analgesia, decreased cost, and improve the postoperative rehabilitation [5].

The peribulbar block is preferred over the retrobulbar block as it is easier, safer, and associated with a lesser complication [6]. In spite of that, its use may be limited or difficult owing to the longer surgery and the limited duration of the block [7]. Many agents, especially opioid analgesics, are used in combination with different local anesthetic mixture in order to improve the quality of regional block [8].

Dexmedetomidine, the highly potent and selective Alpha adrenergic 2 receptor agonist, was accepted by the United States Food and Drug Administration (FDA) to be used as sedative agents as it has sedative, sympatholytic, analgesic, and amnestic properties [9]. There are multiple studies evaluating the use of dexmedetomidine addition to different local anesthetics in epidural anesthesia [10], subarachnoid anesthesia [11,12], peripheral nerve block [13,14], and local anesthesia [15,16]. The use of dexmedetomidine as a local anesthetic adjuvant may alter the quality of the block. We aimed to study the effect of the addition of dexmedetomidine to local anesthetics in single injection peribulbar anesthesia for patients undergoing retinal surgeries. The primary outcome was the duration of globe akinesia, While, the onset and the duration of anesthesia were considered as secondary outcomes.

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2. Patients and methods

Up till now, dexmedetomidine wasn't accepted by the FDA for the perineural administration. Moreover, in our Country, there is no similar association for permission of new drugs usage. Thus, the perineural administration of dexmedetomidine was explained to the local ethical committee to detect that perineural administration of a dose of 20–100 μg is safe based upon previous similar studies [13,15,16], then, the study was approved by the ethical committee (Tanta Faculty of Medicine Research Ethics Committee 30690/01/2016). Then, the study had been registered on the Pan African Clinical Trial Registry since February 2016 with the unique identification number for the registry (PACTR201603001485381).

This controlled, randomized, double-blinded study was performed at the Ophthalmology Department of Tanta University Hospital. The study was started in February 2016, immediately after obtaining ethical committee approval, and lasted for one year. The study included adult patients aged 30–60 years old, of both sexes, with ASA physical status from I to III, scheduled for vitreoretinal surgeries.

All the patients were assessed preoperatively in the ophthalmic and anesthesia clinics, then, reassurance of the patients was done with an explanation of the purpose of the research. If the patient agreed to participate in the study, an informed written consent was obtained from him or herself. The patients were admitted to the operating room after 8 hours fasting from solid food and 2 hours fasting from clear fluids. All the data obtained in this research work were kept secret through secret codes and files and used only for this research work. Once the patients were admitted to the operating theater without premedication, they were reassured with obtaining intravascular venous access through peripherally inserted 20 gauge venous cannula, then, the patients were attached to the monitor in the form oxygen saturation, 5 leads electrocardiogram, and non-invasive blood pressure. A nasal cannula was used at a flow rate of 2–4 l/min to supply oxygen to patients. An anesthesiologist resident who was blinded to the study was used to prepare the local anesthetic mixture in uniform syringes and introduce them in a sealed envelopes.

Exclusion criteria were consisted of, refusal of patients to participate, unconscious or uncooperative patients, the coexistence of glaucoma or ocular infection, suspected or diagnosed coagulopathy, or patients with uncontrolled cardiac conditions. The patients were randomly allocated into two equal groups through computer generated randomization in sealed opaque envelops to allow every patient to choose his own group (Fig. 1).

Control group (C group) (30 patients); Patients in this group received peribulbar block with 10 ml of a local anesthetic mixture composed of 4 ml of plain bupivacaine 0.5%, 4 ml of lidocaine 2% containing 50 IU hyaluronidase, and 2 ml of normal saline.

Dexmedetomidine group (D group) (30 patients); The local anesthetic mixture received in patients of this group was composed of 4 ml of plain bupivacaine 0.5%, 4 ml of lidocaine 2% containing 50 IU hyaluronidase, and 20 μg of dexmedetomidine dissolved in 2 ml (Total volume 10 ml).

Disposable needles in a size of 25 gauge and 16 mm bevels were used to perform the peribulbar injection. The injection site was limited by the lateral nasal margin laterally, inferior orbital margin inferiorly, and the lower lacrimal punctum superiorly [17]. Once the needle was introduced, the patient was asked to look in the four cardinal directions of the gaze, superior, inferior, nasal, and temporal to ensure that the needle wasn't penetrating the eye globe, then negative aspiration was done to exclude intravascular position of the needle, then, the peribulbar injection of previously prepared local anesthetic mixture was performed over 30 seconds and followed by fullness of the eye lids. The eye lids were closed and covered by eye pads carefully with an application of 20 mmHg pressure through an intermittent application of Honan ball for 10 min. The intermittent eye compression was relieved after 1 min, 3 min, 5 min, 7 min, 9 min, and 10 min to assess the onset and the quality of sensory and motor blockade. All the intraoperative or postoperative measurements were obtained by the aid of an assistant nurse who wasn't participating in the study.

Sensory block was assessed by the abolishment of corneal reflex to instillation of physiological drops on the cornea or conjunctiva. The onset of anesthesia was determined by the time interval from local anesthetics injection and loss of corneal reflex. The motor block was evaluated by asking the patient to open, close, and squeeze his eye (Lid Akinesia) and to move his eye globe in the four directions of the gaze (globe akinesia). The quality of akinesia was assessed through the use of akinesia score where 0 = inability to move (total akinesia), 1 = partial movement (partial akinesia), and 2 = full movements (no akinesia). This score was used to assess both lid akinesia and globe akinesia in the four directions with the overall score of 10 [18]. The onset of lid akinesia was calculated from peribulbar injection to the partial loss of ability to open or squeeze eye lids, while, the onset of globe akinesia was estimated from the injection of the local anesthetic mixture and partial loss of movement of eye globe in the four cardinal directions. The surgery was considered to be optimal to be started when the patient had corneal anesthesia together with partial lid and globe akinesia. The optimal time to start the surgery was considered as the elapsed time between local anesthetics injection and satisfying the goals to start the surgery. The intraocular pressure was measured preoperatively and immediately before initiating the surgery with detection of number of patients with increase in the intraocular tension (increase intraocular pressure more than 25 mmHg or by more than 10 mmHg than the preoperative value)

The duration of sensory block was estimated to be the time interval from the peribulbar injection till regaining corneal sensation, while, the duration of lid or globe akinesia was determined by the time elapsed between performing the peribulbar injection and the full regaining of lid or globe movement respectively. The Ramsay Sedation Score (Table 1) [19] was used to evaluate the patients level of sedation in the intra and postoperative periods as it was measured every 15 min from the start of the surgery and measured every 2 h after completing the surgery till 12 h. In the postoperative period, the visual analogue score (VAS) which is composed of 0–10 score was used to assess the severity of postoperative pain (where 0 = no pain and 10 = severe pain), The VAS score was evaluated 1 h, 2 h postoperative, then every 2 h till 12 h. Any patients with VAS score more than 4 received rescue analgesia in the form of 50 mg tramadol intravenous injection together with 500 mg paracetamol by intravenous infusion with calculation of the time for the first call of postoperative analgesia. Any detected complication as nausea and vomiting, pain on injection, or increased intraocular tension was recorded.

3. Statistical analysis

Based on the results of the previous study [16] calculation of sample size revealed that, at least twenty-six patients were required in each group to detect a significant difference of 45 minutes in the duration of the motor blockade at alpha error 0.05 and power of study 90%. The statistical analysis was carried out by the use of (SPSS Inc., Chicago, IL, USA). Categorical data, except ASA class, were analyzed by Fisher's exact test and expressed as number and percent. While ASA class was analyzed by the aid of Chi-Squared test and presented as number and percentage. Parametric data were expressed as a mean and standard deviation after analysis through the unpaired T test. Statistically significant changes were considered when the p value was less than 0.05.

4. Results

Seventy-three patients were assessed for eligibility to participate in this study, five of them refused to participate, while eight of them were not meeting our inclusion criteria, so, thirteen patients were excluded from the study while the remainder sixty patients were randomly