



The Effect of Retrobulbar Block and Intravenous Atropine on Oculocardiac Reflex in Vitreoretinal Surgery

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Received 2018 July 31; Revised 2019 February 02; Accepted 2019 March 16.

Abstract

Background: Cardiac parasympathetic stimulation due to manipulation or stimulation of ocular structures that leads to sinus bradycardia, atrioventricular block or even asystole is called oculocardiac reflex.

Objectives: This study aimed at comparing two anesthetic techniques (i.e., retrobulbar block and intravenous atropine for oculocardiac reflex prevention in vitreoretinal surgery).

Methods: Patients undergoing vitreous and retinal surgery were randomly selected as a source of sampling during six months, from September 2017 to February 2018. All the patients enrolled in the study after the inclusion and exclusion criteria were assigned and after getting informed consent. A total of 124 patients were evaluated and compared in two groups, each consisting of 62 patients (retrobulbar block and intravenous atropine).

Results: Essentially, there were no demonstrated differences between groups in regards to patient demographics or basic heart rate (HR). Among the patients, there was not any oculocardiac reflex (OCR) in the retrobulbar block group; however, in the atropine group, two patients (3.2%) had OCR, and in contrast, 60 patients (96.8%) had no reflex. There was no statistically significant difference between two groups in OCR occurrence ($P = 0.496$).

Conclusions: In a general conclusion, there was no difference between the two methods (i.e., retrobulbar block anesthesia and intravenous atropine) in the prevention of OCR. However, based on the results, it is believed that the retrobulbar block is associated with more stable HR and lower frequency of OCR in vitreoretinal surgery.

Keywords: Retrobulbar Block, Intravenous Atropine, Oculocardiac Reflex, Vitreoretinal Surgery

1. Background

Sinus bradycardia, ventricular, atrioventricular block, or even asystole induced by extrinsic muscle twitching were first introduced in 1908 by Aschner and Dagnini as an oculocardiac reflex. Although manipulation of orbital components can result in the occurrence of this reflex, the most common cause of reflex is the manipulation of the rectus muscle (1). The importance of this reflex was highlighted when Sorenson and Glymor reported a case of cardiac arrest due to stretching of the internal rectus muscle (2). This reflex is a trigeminovagal reflex. The ventricle branch of this neural reflex is a cardiac depressor, which leads to decreased heart rate (3). The parasympathetic stimulation results in hypotension, sinus bradycardia (e.g., the most common manifestation of this reflex) (4), ventriculoatrial blocks, and cardiac dysrhythmias (i.e., atrial fibrillation, asystole, and cardiac arrest) (5). Almost all eye surgeries such as strabismus, orbit, cataract, glaucoma, and vitreoretinal surgeries can cause this reflex, and

depending on the type of surgery, its prevalence varies from 14% to 90% (6, 7). In 1973, Apt et al. reported an incidence of oculocardiac reflex of 67.9% (8). Continuous heart rate decline is referred to as oculocardiac reflex. Aschner et al. described OCR as a 20% decrease in the baseline heart rate. In some studies, this reflex was reported as a 10% decrease in heart rate (5). Due to complications of this reflex, several studies have been conducted to introduce more effective preventive measures. Oculocardiac reflex prevention approaches include intravenous anticholinergic, ketamine, meperidine, and retrobulbar block. Each of these methods have been used with contradictory results (9, 10). Due to the fact that most of the patients undergoing vitreoretinal surgery are from the elderly population and suffer from various underlying diseases such as diabetes mellitus, HTN, atherosclerosis, and various forms of arrhythmias such as atrial fibrillation (AF) and ischemic heart disease (IHD), the routine administration of atropine (IV) for the prevention of oculocardiac reflex can lead to

high blood pressure episodes, atrial fibrillation with rapid ventricular response and even cardiac infarction with increased heart rate (11).

2. Objectives

Regarding the high prevalence of oculocardiac reflex in eye surgery and its undesirable side effects, the aim of this study was to compare two common methods of prevention of oculocardiac reflex (IV atropine and retrobulbar block) in vitreoretinal surgery. Therefore, if the retrobulbar block is more effective than IV atropine, it can be used in elderly patients with underlying cardiovascular disease for prevention of reflex due to its lower systemic complications and local nature.

3. Methods

This descriptive-analytical study was conducted on 124 cases who were undergoing vitreoretinal surgery after obtaining informed consent and ethical number (57706) from the Ethics Committee of Tabriz University of Medical Sciences during six months, from September 2017 to February 2018. Based on previous studies, 62 samples were selected for each group ($\alpha = 0.05$, power = 80%, difference = 20%). Patients with coagulation disorder, endophthalmitis, having a pacemaker, consumption of beta-blockers and calcium channel blockers, and ischemic heart disease were excluded from the study. Patients were randomly selected among eligible patients who were aged between 50 to 70 years and who were undergoing vitreoretinal surgery. Randomization was performed using Randlist V. 1.2 software. Anesthesia was induced by 1 mg midazolam, 1 mg/kg lidocaine 2%, 1 μ g/kg fentanyl, 2 mg/kg propofol, and 0.15 mg/kg cisatracurium. The airway was secured by Laryngeal Mask Airway (LMA). Anesthesia was maintained by isoflurane 2%, 50% oxygen, and 50% N₂O. After induction of anesthesia and under sterile conditions, ophthalmologist injected 20 mg lidocaine (5%) by needle 25-gauge in the intersection of the lower and lateral walls of the orbit. After the retrobulbar block, ocular paralysis was examined by an ophthalmologist to ensure complete blocking and, if the block was not successful, the case was excluded from the study. Atropine group received 0.5 mg IV atropine after induction of anesthesia. Intraoperatively, all patients were assessed by an anesthesiologist in turn to the occurrence of oculocardiac reflex (i.e., decreased heart rate of more than 10% under the patient's basic heart rate) or cardiac arrhythmias.

It should be noted that the second anesthesiologist monitored the patient; he/she didn't have any knowledge regarding the administered drug. If the reflex occurred,

the surgeon was asked to stop the manipulation of the eye globe. If the reflex continued for more than 20 seconds after discontinuation of manipulation, 0.5 mg IV atropine was administered, and HR was evaluated. Data were analyzed by descriptive statistical methods (frequency - percentage, mean \pm standard deviation), mean comparison test for independent groups or chi-square test, and if necessary Fisher exact test. SPSS V. 16 statistical software was used. The P value of less than 0.05 was considered statistically significant.

4. Results

Of the 124 (64 males, 60 females) patients, 62 patients (31 males and 31 females) were in the retrobulbar block. In the atropine group, 33 patients (53.2%) were male. There was no significant difference between groups based on gender (Table 1). A total of 58 (46.8%) cases had no previous history of disease (P = 0.719).

Table 1. The Gender Distribution Between Groups

Gender	Atropine, No. (%)	Retrobulbar Block, No. (%)	P Value
Male	33 (53.2)	31 (50.0)	0.719
Female	29 (46.8)	31 (50.0)	

The mean \pm SD of age at which reflex was more observed was 62.5 \pm 2.12 years, and mean \pm SD of the age of patients who did not show oculocardiac reflex was 60.11 \pm 5.33 years. There was no significant difference in the incidence of reflex (P = 0.498).

In the retrobulbar block, 17 patients (27.4%); and in atropine group, 41 cases (66.1%) had a negative history. Of the 116 cases (93.5%), two cases (1.6%) and six (4.8%) underwent deep vitrectomy, cataract plus deep vitrectomy, and retinal detachment, respectively. This reflex was not observed in the retrobulbar block, however, in the atropine group, two cases (3.2%) had an oculocardiac reflex. There was no statistical significant difference between the two groups. There was no significant association between the incidence of reflex and age (P = 0.193). Oculocardiac reflex occurred in only two patients with a positive history of the underlying disease (one case with a history of hypertension, diabetes, and hyperlipidemia), and other had a history of BPH. There was no significant difference in the type of ophthalmic surgery performed in patients with oculocardiac reflex (P = 0.932). Both patients had undergone deep vitrectomy surgery.

5. Discussion

In the present study, 124 patients were investigated in two groups as the retrobulbar block and IV atropine

groups. There was no significant difference between age and incidence of oculocardiac reflex ($P = 0.193$). The oculocardiac reflex was not observed in the retrobulbar block group, however, in the atropine group, two cases (3.2%) had an oculocardiac reflex. There was no statistically significant difference between two groups in the study ($P = 0.496$). There was no significant difference in the incidence of oculocardiac reflex in patients ($P = 0.498$). This reflex was observed in only two patients who had a history of the underlying positive disease (i.e., hypertension, diabetes, and hyperlipidemia), and the other patient had a history of benign prostate hypertrophy (BPH). There was no significant difference between the type of ophthalmic surgery and oculocardiac reflex ($P = 0.932$). These patients with positive oculocardiac reflex underwent deep vitrectomy surgery.

Oculocardiac reflex is referred to a sudden onset of parasympathetic stimulation, which is associated with heart rate loss due to stimulation of each of branches of the trigeminal nerve (12). Risk factors of reflex are hypoxemia, light anesthesia, hypercapnia, age, gender, the nature of reflex triggers (strength and duration of stimulation) and potent narcotic inducing sleep apnea (i.e., sufentanil and alfentanil), beta blockers, and calcium channels blockers (13). Based on the results of some studies, the incidence of this reflex is much higher in women (8). The administration of atropine can completely inhibit mentioned reflex, which confirms the role of the parasympathetic system in its development (14). It seems that the age of patients who underwent surgery does not impact the incidence of reflex, and it is possible to admit patients without consideration the reflex incidence in eye surgery according to age factor (15). Based on recent studies, this reflex is rare and mentioned findings are consistent with our study (13, 16-18). Of course, there has been a high incidence of this reflex. Thus, other factors contribute to the occurrence of this reflex in vitreoretinal and retinal procedures (6, 8). Aletaha et al. (19) evaluated the prevalence of oculocardiac reflex in strabismus surgeries, which was 85.5%.

In contrast, Gilani et al. showed atropine decreases the frequency of reflex occurrence (11). In our study, the incidence of reflex is lower than that of the Bagheri study (19), which seems to be due to the lower dose of local anesthetics and the variety of surgical methods. One new survey demonstrated that HR occurred during conjunctival incision, muscle dissection, and muscle traction 94, 90, and 96 bpm, respectively, and in an infratrochlear block group, higher HR and lower oculocardiac reflex was observed (all $P < 0.05$) (20).

5.1. Conclusions

Generally, based on the results, there is no difference between two methods of retrobulbar block anesthesia and IV atropine in the prevention of reflex. This study could not explain age and underlying illness impact in the incidence of reflex in patients who had a vitreoretinal procedure by retrobulbar blockage or IV atropine therapy. However, OCR was more common in the atropine group.

5.2. Suggestions and Limitations

It is suggested that a study with a larger population of patients and other eye surgeries, including strabismus and eye traumatic lesions, should be conducted to compare the effect of two methods of retrobulbar anesthetic and IV atropine in the prevention of oculocardiac reflex. Due to the fact that ignored consideration of the hypoxia and hypercapnia effects this study, it is recommended that in future studies, the effect of ventilator settings, the association between ABG alteration, and the incidence of oculocardiac reflex will be evaluated.

Footnotes

Authors' Contribution: Design: Amirhossein Fathi; collection of data: Amirhossein Fathi and Hojjat Pourfathi; searching and writing of article: Haleh Farzin and Hojjat Pourfathi; analysis of data: Amir Abdi Rad.

Conflict of Interests: The authors declared no conflict of interests.

Ethical Considerations: Ethics Committee of Tabriz University of Medical Sciences (ethical no.: 57706).

Funding/Support: The authors declared no funding/support.

Patient Consent: This study was conducted on cases who were undergoing vitreoretinal surgery after obtaining informed consent.

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