Archives of Anesthesiology and Critical Care (Autumn 2024); 10(Supplement 2): 541-546.

Available online at http://aacc.tums.ac.ir

Research Article

Comparison of the Effect of Intravenous Atropine and Hyoscine on the Frequency of Oculocardiac Reflex in Scleral Buckling Surgery: A Triple-Blinded Randomized Clinical Trial

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ARTICLE INFO

Article history:
Received 20 January 2024
Revised 12 February 2024
Accepted 26 February 2024

Keywords:
Atropine;
Hyoscine;
Oculocardiac reflex;
Scleral buckling surgery

ABSTRACT

Background: Oculocardiac reflex is a trigeminovagal reflex that occurs following mechanical manipulation of the orbital cavity. The current study evaluated the preventive effect of atropine and hyoscine on the Oculocardiac reflex in scleral buckling surgery.

Methods: In this triple-blinded randomized controlled clinical trial, a total of 75 patients candidated for scleral buckling surgery were divided into three groups. Intravenous atropine (0.02 mg/kg up to a maximum of 0.5 mg), hyoscine (0.2 mg/kg), and distilled water were injected after intubation for each group respectively with standard monitoring. Heart rate, blood pressure and/or cardiac dysrrythmia were recorded immediately before/after injection and every 10 minutes. Decrease of heart rate more than 20%, or any cardiac dysrrythmia were defined as OCR. P-value <0.05 was significant.

Results: Demographic parameters were not different in three groups. Oculocardiac reflex was observed in hyoscine (34.8%), atropine (31.6%) and control (35.3%) groups (p=0.27). Additive atropine was injected only in two patients of control group. Oculocardiac reflex occurred more in the first ten minutes (35%) and in 30 minutes (55%), and was not observed after 90 minutes. Moreover, atropine and hyoscine increased the heart rate of patients more than control group (P=0.02), but in atropine group was longer than hyoscine group (P=0.03). Systolic blood pressure was not significantly different among the groups.

Conclusion: In this study had been showed that in scleral buckling surgery, atropine is more effective than hyoscine in heart rate increase, but did not reduce oculocardiac reflex more significant than hyoscine and control group. And also oculocardiac reflex was more in first 30 minutes.

Introduction

Oculocardiac reflex (OCR) is a trigeminovagal reflex that occurs following mechanical manipulations, pressure or stretching of the orbital cavity or extraocular muscles specially in strabismus surgery [1-3]. OCR can lead to bradyarrhythmias, nodal rhythms, ectopic beats, ventricular fibrillation, or asystole, and also increases gastrointestinal motility, nausea, and vomiting [4-8]. OCR can sometimes be fatal and causes coronary artery spasm [9-10]. Several factors can also exacerbate this complication, such as ocular injection, hypercapnia, hypoxemia, and insufficient depth of anesthesia, but is fatigable reflex [11].

To reduce the occurrence of OCR, various strategies such as retrobulbar block and pretreatment with anticholinergics are developed [12-15]. Atropine and hyoscine have antimuscarinic effects and non-

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specifically induce tachycardia, mydriasis, and dry mouth [16-19]. Hyoscine increases heart rate and mucosal dryness more than atropine, but has more short-term cardiac effects. They could correct intraoperative dysrhythmia and reduce bradycardia and arrhythmias induced by OCR [20].

The effects of anticholinergics, especially hyoscine, on OCR as well as in scleral buckling surgery have been less studied. Aim of this clinical study was to compare the effects of atropine and hyoscine on the frequency of OCR in scleral buckling surgery.

Methods

After approval by the Ethical Committee of Medical University No 980033, this double-blinded randomized clinical trial conducted on 2019 Sep to 2020 Oct. This study was also registered in the Iranian Registry of Clinical Trials (IRCT20120307009229N6). After obtaining written consent to participate in this clinical trial, we enrolled 75 patients who were admitted with posterior ocular problems and retinal detachment and were candidate for scleral buckling surgery.

Inclusion criteria were adults more than 15 years and American Society of Anesthesiologists (ASA) class I-II. Exclusion criteria were: ASA > II, uncontrolled hypertension, coronary artery disease, respiratory disease, addiction, preoperative beta-blocker use, and hyoscine or atropine hypersensitivity.

Based on the randomized block method, Patients were divided into three groups. In this triple-blinded clinical study, the surgeon, the anesthesiologist, and the patient were unknown of study groups. After monitoring, anesthesia was induced with 2 µg/kg fentanyl, 0.5 mg/kg atracurium, and 2 mg/kg propofol. After 2 minutes, patients were intubated and were placed under mechanical ventilation with tidal volume 8 cc/kg. Respiratory rate was adjusted and end-tidal CO2 was maintained in the range of 35-45 mmHg. Then, distilled water was injected in the control group, atropine 0.02 mg/kg (up to a maximum of 0.5 mg) in the atropine group, and hyoscine 0.2 mg/kg in the hyoscine group. Injection was performed by an anesthesiologist and injection volume was the same 2 mililiters.

Systolic blood pressure and heart rate were recorded before injection, after injection, and every 10 minutes until the end of the operation. A decrease in heart rate> 20% and other dysrhythmias during surgery and eye muscle manipulation were recorded as OCR activation. Atropine 0.2 mg/kg was used If the heart rate was < 60 beats/min with hypotension or other dysrhythmias, and if the heart rate was < 40 beats/minute. Intravenous nitroglycerin was infused to control the patient's severe hypertension.

Statistical analysis

Data were analyzed with SPSS software version 16. Chi-square test, Fisher exact test (for qualitative variables), paired T test and repeated measurement Anova test (for quantitative variables) were used for statistical analysis. P value < 0.05 was considered statistically significant.

Results

In this study, 75 patients candidated for scleral buckling were divided into three same groups. Due to high blood pressure in some patients, nitroglycerin was infused and were excluded from the study (8 patients in the control group, 6 patients in the atropine group, and 2 patients in the hyoscine group (Flowchart). No significant differences were found between three groups for demographic and general characteristics (Table 1).

(Table 2) shows the frequency of OCR in three groups. In total, OCR was observed in 34.8%, 31.6% and 35.3% in hyoscine, atropine and control groups respectively. There was no significant difference between the three groups for OCR prevalence (P= 0.27). Supplemental atropine was injected only in two patients of control group. The highest prevalence of OCR occurred early in surgery (35% in the first ten minutes and 55% in 30 minutes). OCR was not observed after 90 minutes in any of the groups.

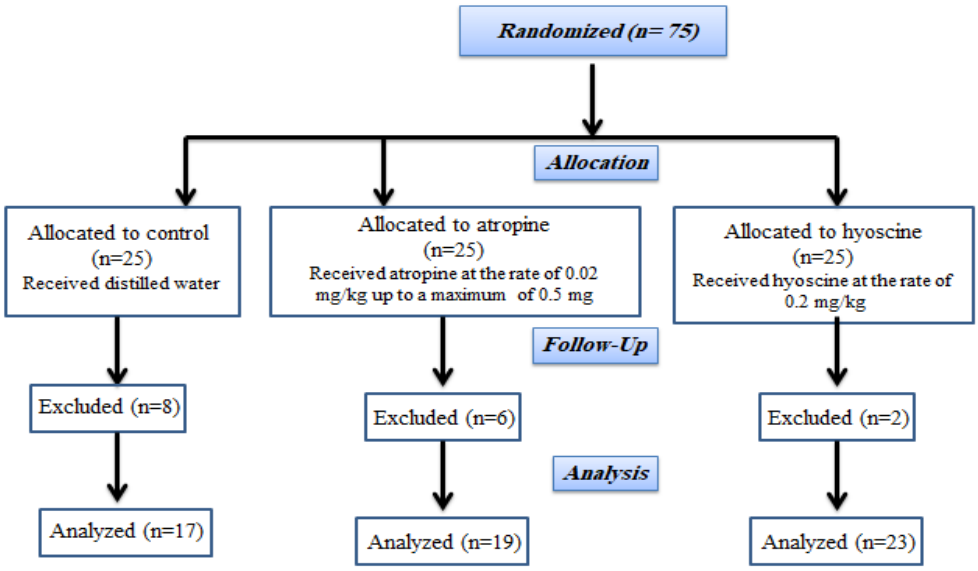
After injection, heart rate was significantly increased in the atropine and hyoscine groups and was higher than the control group (P= 0.02). After half an hour, the heart rate decreased in the hyoscine group, but the increase in heart rate in the atropine group was significantly longer than the hyoscine and control groups (P= 0.03) (Figure 1). During the study, there is not significant statistically difference between three groups in terms of systolic blood pressure (P= 0.26) (Figure 2).

Table 1- general Characteristics of study Patients (mean±sd).

Variables	Groups			P value
	Control n= 17	Atropine n= 19	Hyoscine n= 23	
Age (year)	48.3 ± 19.7	42.6 ± 23.7	38.4 ± 15.9	0.35
Gender (F/M)	5/12	9/10	11/12	0.44
Duration (min)	151.9±23.8	130±32.1	140.5±28.4	0.71
Heart rate (beat/min)	83.4±14.1	85.2±13.8	83.8±13.2	0.45

Table 2- The frequency of OCR based on a 20% reduction in heart rate in three groups of study in different periods. n (%)

Time (minutes)	Control n= 17	Atropine n= 19	Hyoscine n= 23	Total
0-10	1 (5.5)	2 (10.5)	4 (17.5)	7 (35)
10-20	0	1 (5.26)	0	1 (5)
20-30	2 (13.3)	0	1 (4.5)	3 (15)
30-40	1 (7.1)	1 (5.9)	0	2 (10)
40-50	0	1 (6.2)	1 (4.5)	2 (10)
50-60	1 (7.1)	0	0	1 (5)
60-70	0	1 (7.1)	2 (10)	3 (15)
70-80	0	0	0	0
80-90	1 (7.7)	0	0	1 (5)
90-100	0	0	0	0
total	6 (35.3)	6 (31.6)	8 (34.8)	20 (33.9)



Flowchart- The diagram of the patients' recruitment in the study

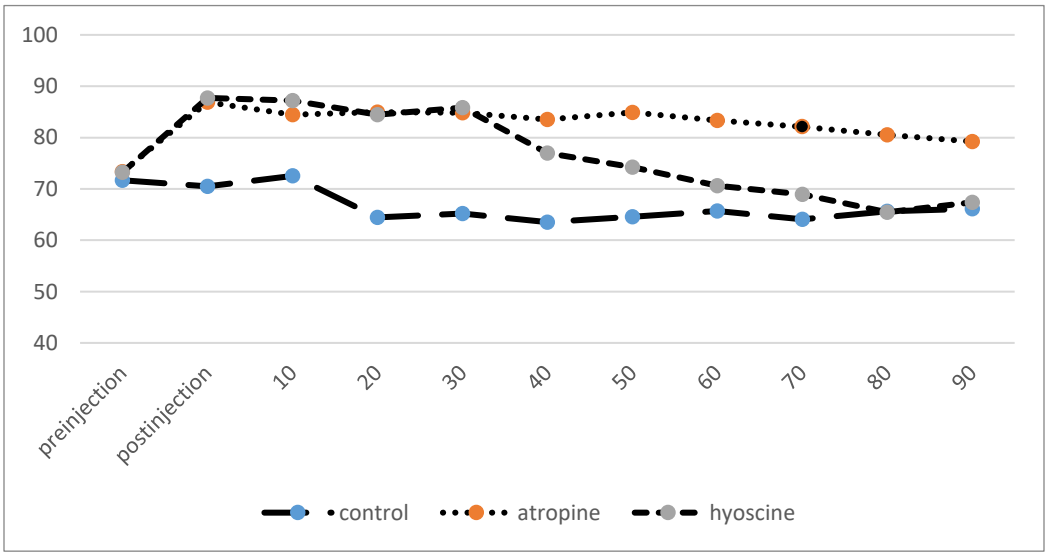


Figure 1- The trend of heart rate changes during the study between three groups

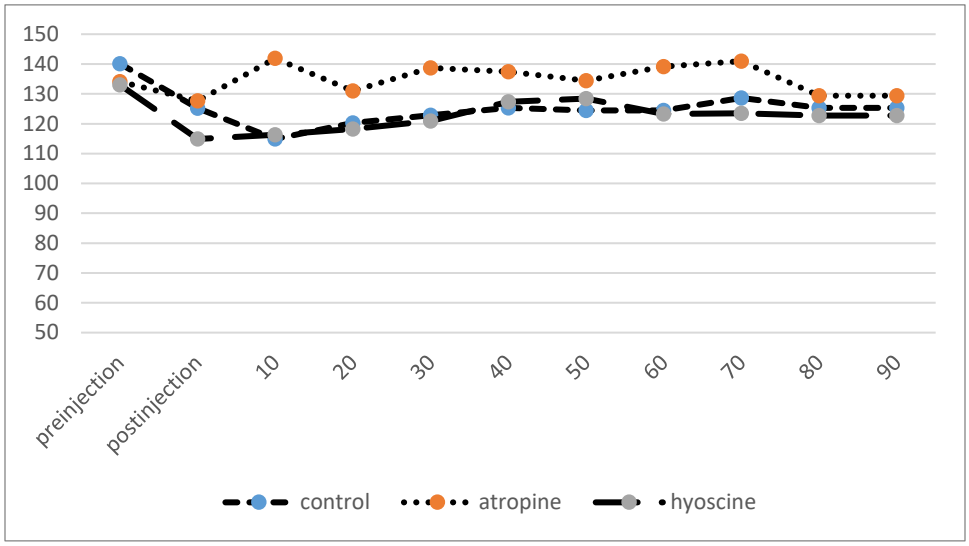


Figure 2- The trend of systolic blood pressure changes during the study between three groups

Discussion

Incidence of OCR during eye surgeries is 32-90%, OCR has serious side effects such as sudden decrease in the blood pressure and heart rate, cardiac arrhythmias, asystole, and respiratory arrest. In the present study, the prevalence of reflex was 31.6-35.3%.

Several research studies have reported the effects of several drugs such as lidocaine, midazolam, ketamine, desflurane, sevoflurane, and atropine in OCR in strabismus surgery [13, 21-25]; however, studies on scleral buckling surgery and the use of hyoscine in OCR are limited. In the current study, we evaluated the effect of atropine and hyoscine on the incidence of OCR in scleral buckling surgery.

In the current study, a total of 59 patients with a mean age of 42.5 ± 19.8 years were included. Despite the increase in heart rate in the atropine and hyoscine groups compared to the control group, the incidence of reflexes (20% decrease in heart rate) was not significantly different in the three groups.

An important parameter evaluated in the current study was the effects of interventions on heart rate reduction, which was shown that atropine was more effective than hyoscine in preventing heart rate reduction during eye surgery. We found that after intubation to the end of the study, atropine more than hyoscine increased the heart rate in scleral buckling surgery. Moreover, the clinical effect of intravenous hyoscine on heart rate decreased after 30 minutes, while the effect of atropine on heart rate continued until the end of the study.

Several studies have examined the effects of atropine on the occurrence of OCR in strabismus surgery and compared with lidocaine. In a randomized clinical trial study in 2015, Espahbodi et al. examined the effect of ketamine and atropine on OCR. This study was performed on 90 patients in the age range of 4-10 years. In this study, the use of atropine significantly reduced the incidence of OCR (from 63% in the control group to 43% in the atropine group) [26]. In another studies, are showed that intravenous or intralingual atropine effectively reduced the incidence of OCR [13, 27-28]. However, in our study, there was no clear difference between the groups, which may be due to the less common OCR in scleral buckling surgery.

In the literature review, limited study has investigated the effect of atropine and specially hyoscine on the incidence of OCR in scleral buckling surgery. In one study, topical lidocaine reduced OCR [29]. But in another study, intravenous atropine was compared with topical lidocaine, and atropine was more effective than topical lidocaine in reducing of OCR [30]. In the present study, the prevalence of OCR was lower, and also atropine and hyoscine had no effect on OCR despite increased heart rate. This may be due to the low patients and the use of nitroglycerin during the study.

In the previous our study, hyoscine and lidocaine reduced OCR in strabismus surgery [31], but in the present study, had little effect on OCR in scleral buckling surgery. In present study, atropine increased the heart rate further and the duration of atropine was greater than hyoscine. Only adults over the age of 15 were present in the current study, and the lower prevalence of OCR may be due to the age of the patients and the type of surgery.

Limitation of this study may be the small sample size and moreover, the variety of muscles and lack of the separation of muscle type.

Conclusion

The results of the current study showed that atropine is more effective and long-lasting than hyoscine in

increasing of heart rate during scleral buckling surgery, but they cannot reduce the OCR in patients. The highest OCR was observed in the first 10-30 minutes, which is a sign of OCR fatigability.

Acknowledgment

The current study was financially supported by Mashhad University of Medical Sciences, Mashhad, Iran (Grant No: 980033).

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