

Comparing the Effect of Using Atracourium and Cis-Atracourium as Adjuvant Agents to the Local Anesthetic Substance on Peribulbar-Induced Akinesia

Mehrdad Godarzi¹, Siyavash Beyranvand², Shahriar Arbabi¹, Mehrdad Sharoughi³,
Robab Mohtaram³, and Alireza Ebrahim Soltani¹

¹ Department of Anesthesiology, Children Medical Center Hospital, Tehran University of Medical Sciences, Tehran, Iran

² Department of Anesthesiology, Shohadaye Ashayer Hospital, Lorestan University of Medical Sciences, Lorestan, Iran

³ Department of Anesthesiology, Farabi Eye Center Hospital, Tehran University of Medical Sciences, Tehran, Iran

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Abstract- Peribulbar anesthesia is widely applied in cataract surgeries. The aim of this study was comparing the effect of using Atracourium, cis-Atracourium, and placebo as adjuvant agents to the local anesthetic substance on peribulbar-induced akinesia in cataract surgeries. The study was double-blind randomized clinical trial, among the patients candidate for the cataract surgery who were hospitalized in ocular surgery ward in Farabi Hospital between 2006 and 2007. 90 patients were subcategorized into 3 groups randomly. Group I received a mixture (8 ml) containing equal parts of Marcaine 0.5%, Lidocaine 2% and Hyaluronidase 90 IU plus 0.5 ml normal saline; group II received the mixture (8 ml) plus 0.5 ml Atracourium 5 mg, and group III received the mixture (8 ml) plus 0.5 ml cis-Atracourium with the help of peribulbar blockage technique. The score of akinesia were evaluated in the 1st, 3rd, 5th, 10th minutes after administration of the medications. 10 minute after drug administration, 25 (92.6%) reached the total akinesia with Atracourium, 23 (85.2%) with cis-Atracourium, and 23 (85.2%) with the placebo ($P>0.05$). Addition of low-dose Atracourium and cis-Atracourium to the anesthetic drug is recommended in order to accelerate the onset of akinesia resulted by the peribulbar block, and in order to enhance the quality of akinesia especially when Hyaloronidaze is not added.

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Introduction

Local anesthesia has been progressed greatly in recent years. Surgeons have been using the local anesthesia for ophthalmological procedures since 1884 (1). Nowadays, regional anesthesia with the help of retrobulbar or peribulbar blocks or topical anesthesia is being used in cataract surgeries (2). The key role of anesthesia is akinesia-establishment that helps the surgeon during the operations. The retrobulbar technique is more effective and rapid than the peribulbar methods in establishing the akinesia. However it potentially carries hazardous side toxicities such as brainstem numbness, posterior ocular bleeding, and optic nerve damage (3,4). Moreover, Hyaluronidase has useful effects in establishing akinesia (2). Pain-controlling through restricting the movements during the surgery constitutes the main role of anesthesia in ocular surgeries. In comparison to

retrobulbar anesthesia, the peribulbar technique induces far less pain.

These types of anesthesia may prove to be useful even without the synchronic application of sedative substances, whereas, the pain felt by the patients during operation are more severe following the exploitation of topical analgesics. Thus, comparing to other techniques, the peribulbar and retrobulbar anesthesia have successfully proved themselves in clinical trials.

In cataract surgeries, different types of anesthetic techniques are being used considering the convenience and comfort for both the surgeon and the patient. However; taking into account the usage of sedation during the injection in different types of anesthesia, the peribulbar and retrobulbar anesthesia have been considered as appropriate for the cataract surgeries, particularly in surgeries where establishing akinesia is of vital importance for the surgeon (2).

Corresponding Author: Siyavash Beyranvand

Department of Anesthesiology, Shohadaye Ashayer Hospital, Lorestan University of Medical Sciences, Lorestan, Iran
Tel: +98 661 2202034, 912 5224355, Fax: +98 661 2205005-6, E-mail: beiranvandsiavash@yahoo.com

Peribulbar anesthesia is widely applied in cataract surgeries, however, the onset of akinesia is way behind and slower in comparison to that for the retrobulbar technique (5). Despite the fact that the method of peribulbar block brings forth less severe toxicities comparing to the retrobulbar technique (3, 4), nonetheless, surgeons may still apply it less frequently due to the slower onset of the effect and its inadequate movement block (5). According to some studies, the effect of using Atracurium and its derivatives as adjuvant to the peribulbar block in developing ameliorated conditions in absence of any adverse affects, and in accelerating the onset of akinesia have been implicated (5-7). Moreover; since an inadequate motor block interferes negatively while the surgeon is operating, and undesired eye movements under microscope may cause complications that in certain occasions prove irremediable, and considering the possibility of widely using of peribulbar blockages in cataract surgeries through establishing akinesia, a low dose of Atracurium and cis-Atracurium in combination with a local anesthetic solution was used in this study for the purpose of accelerating total immobility of the eyes, ocular muscle paresis, and for a more satisfaction of the surgeon during his surgery. The above-mentioned plan has been put into practice for the purpose of comparing the effect of using Atracurium, cis-Atracurium, and placebo as adjuvant agents to the local anesthetic substance on peribulbar-induced akinesia in cataract surgeries.

Materials and Methods

The study was double-blind randomized clinical trial, among the patients candidate for the cataract surgery who were hospitalized in ocular surgery ward in Farabi Hospital between 2006 and 2007. 90 individuals were chosen following a written letter of consent. The method of choosing samples was practically sequential. All the qualified individuals were chosen in order of referral until the completion of the considered sample volume. In sorting these individuals it was taken into consideration that they should have been clear of any recorded file for systemic diseases and local anesthetic contradiction which may cause them exclusion from the study. All these individuals were subcategorized into 3 groups. In group 1, they received the combination of Marcaine 0.5%, Lidocaine 2% and Hyaluronidase 90 IU with the volume of 8 ml plus 0.5 ml normal saline. In group 2, they received Marcaine 0.5% and Lidocaine 2% and Hyaluronidase 90 IU with the volume of 8 plus

0.5 ml Atracurium (5 mg). In group 3, patients received Marcaine 0.5%, Lidocaine 2% and Hyaluronidase 90 IU with the volume of 8 ml plus 0.5 ml cis-Atracurium (1 mg).

All the solutions were prepared by an anesthesiologist, and all blocks were performed by a surgeon-ophthalmologist without being aware of the type of the group of patient. The injections were carried out using a needle (25G) with the length of 25mm being connected to a syringe containing anesthetic solution pierced into the orbital space through the lower temporal orbital rim, and then, a bit higher than the bottom of the orbit and very close to the bone. The surgeon conducted the needle backwards in the sagittal plane, parallel to the orbital bottom up to the very linkage point between the needle and the hub in order to be placed opposite to the anterior side of the loop. After the aspiration, when the surgeon made certain that there would be no blood in the aspiration, anesthesiologist attempted to inject all the volume of the local anesthetic. The onset of the drug effect and the motion range of the extra-ocular muscles together with the score of akinesia were all evaluated by an individual surgeon who was unaware about the type of solution in the 1st, 3rd, 5th and 10th minutes after injection. For the purpose of scoring akinesia in this plan, score 0, score 1, and score 2 were defined as total; relative; no-akinesia respectively (Table 1) (8).

In case of total akinesia, the block would have considered as convincing. The next day after the surgery, the same surgeon having visited the patient, unknowing of the anesthetic compound, had mentioned the possible adverse effect in the designated form. All the gathered data were registered in the data or informational sheets.

Eventually; it's noteworthy that the relevant personnel who wrote down the concerning information were uniformed about the group-placement of each patients, nor the patients were aware of their own group-placement, thus, the plan was performed in a double-blind manner. It is necessary to mention that the patients whom the block was not successful and subsequently suffered from pain were excluded from the study. All the encoded data was entered to the computer memory through the statistical program SPSS. The comparison of the quantitative variables mean and the comparison of the qualitative variables mean were respectively accomplished by a Chi-square test. $P < 0.05$ was considered significant.

Table 1. Scoring System for the motion range of the extra-ocular muscles after the block with Atracurium

0	Total akinesia	0-1mm motion in 1 to 2 main directions
1	Relative akinesia	1mm motion in each of the main directions or 2mm motion in 2 or many other main directions.
2	No-akinesia	more than 2mm motion range in each of the main directions or 2mm motion range in 2 or more main directions.

Results

The mean of the age of the patients was 70.7 ± 56.1 years, of which the number of males was 47 (51.9%) and the number of females was 43 (48.1%). One minute time after the injection, the number of individuals reaching to the total akinesia was 17 (51.9%) with Atracurium, 21 (66.7%) with cis-Atracurium, and 14 (42.3%) with placebo. Three minutes after the injection, the number of subjects reaching to total akinesia was 22 (73.1%) with Atracurium, 25 (81.5%) with cis-Atracurium and 20 (63.0%) with the placebo. Five minutes after injection, the number of subjects reaching to total akinesia was 27 (88.9%) with Atracurium, 26 (85.2%) with cis-Atracurium, 24 (77.8%) with placebo. Also; in the 10th minute after the injection, the number of subjects reaching to total akinesia was 28 (92.6%) with Atracurium, 26 (85.2%) with cis-Atracurium, and 26 (85.2%) with placebo. The comparison of the of akinesia intensity in different times of injection for three groups of Atracurium, cis-Atracurium, and placebo is shown in Table 2, none of which conveyed any statistically meaningful difference.

Having compared the intensity of akinesia in groups of Atracurium and cis-Atracurium versus the placebo group in the 10th minute, no statistically meaningful difference was indicated. It was demonstrated that the total akinesia is comparatively more frequent in group of Atracurium and cis-Atracurium than in the placebo group. No cases of systemic or ocular adverse effects were recorded in any group that could be resulted by the block or drug administration.

Discussion

With an examination on the acquired results from the study, we can notice that the quality of akinesia in the 10th minute in the Atracurium group was comparatively better, and 92.6% of the patients underwent the total akinesia; whereas, the percentage of the total akinesia for the cis-Atracurium group and the placebo group in 10th minute was 85.2% and 85.2% respectively ($P=0.088$). The studies of Soltanmohammadi and his colleagues is in line with our studies (6). They reported achieving the total akinesia with Atracurium in the 10th minute after the concerned injection in 90% of their sorted patients (6).

Table 2. Comparison of the intensity of akinesia in different times of injection in 3 groups of Atracurium, cis-Atracurium and placebo

Time after the injection	Score	Atracurium group N=27	cis-Atracurium group N=27	Placebo group N=27	P-value
1 st (minute)	0	17 (51.9%)	21 (66.7%)	14 (42.3%)	0.414
	1	8 (29.6%)	5 (18.5%)	7 (26.9%)	
	2	5 (18.5%)	4 (14.8%)	8 (30.8%)	
3 rd (minute)	0	22 (73.1%)	25 (81.5%)	20 (63/0%)	0.372
	1	5 (19.2%)	2 (7.4%)	4 (14.8%)	
	2	2 (7.7%)	3 (11.1%)	6 (22.2%)	
5 th (minute)	0	27 (88.9%)	26 (85.2%)	24 (77.8%)	0.447
	1	3 (11.1%)	3 (11.1%)	3 (11.1%)	
	2	0 (0%)	1 (3.7%)	3 (11.1%)	
10 th (minute)	0	28 (92.6%)	26 (85.2%)	26 (85.2%)	0.088
	1	2 (7.4%)	4 (14.8%)	1 (3.7%)	
	2	0 (0%)	0 (0%)	3 (11.1%)	

According to another reported by Arici and Kucukyavuz, the achievement of total akinesia in Atracurium groups was 100% (5). However, upon to our studies, the quality of akinesia in the 1st and 3rd minute with cis-Atracurium was comparatively better than that of other two groups, and they reached the Zero akinesia in a shorter time; whereas, the quality of akinesia in Atracurium group in the 5th and 10th minute was better in comparison with other two groups. This difference was however not statistically significant probably due to small sample size or because of adding Hyaluronidase as adjuvant to the anesthetic solution in all three groups. It is worth considering that Hyaluronidase was not administered in the similar studies. Also in this study, 10 minutes after injection, we didn't observe the akinesia in 2 patients in the Atracurium and cis-Atracurium groups, while akinesia was not observed in 3 patients in the placebo group. This finding may show a better quality of inducing akinesia in these two first groups comparing to the placebo. In the present study none of the patients were considered as requiring the injection of an additional drug. As a matter of fact, the onset of inertness or akinesia is accelerated by adding Atracourium and cis-Atracourium, therefore, the surgeon attempts to start the operation in an earlier time or in case of starting it already earlier, the surgeon would be able to precede it with a more effective akinesia. Considering the findings of this study, adding a low dose Atracourium or Cis-atracourium to the anesthetic drug is recommended in order to accelerate the onset of akinesia resulted by the peribulbar block, and in order to enhance the quality of akinesia especially when Hyaluronidase is not added. Meanwhile; there was not reports of any ocular or systemic toxicity followed by the topical injection of the local relaxants during or after the local anesthesia. Our studies also, hasn't shown any specific ocular or systemic toxicity that could be incurred by Atracourium or cis-Atracourium administration, instead we demonstrated merely some relaxation of the external ocular muscles that can be considered as a beneficial effect of the peribulbar block. However; it's to be recommended to extend our studies with a larger sample size. As in the cataract surgeries regarding the comfort and convenience of both surgeon and the patient, the peribulbar technique of anesthesia has been recognized as appropriate especially for the prolonged operations where inducing akinesia is a vital issue. We also recommend carrying out studies over the onset of akinesia and the length of time of akinesia using

Atracourium and cis-Atracourium to the anesthetic solution. Whereas, Hyaluronidase is expensive and inaccessible in some countries, we recommend carrying out studies similar to the present study without usage of Hyaluronidase. As a last point, due to the fact that the onset of akinesia in peribulbar anesthesia is comparatively slower than in retrobulbar anesthesia; so, in forthcoming studies over the above mentioned techniques of anesthesia administered with adding Atracourium and cis-Atracourium to the anesthetic solution for the purpose of upgrading the onset of akinesia, it's recommended to compare the duration and quality of akinesia.

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