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Original Article

Perioperative Evaluation after Cataract Surgery in Patients Taking Antithrombotic Medication

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Purpose: To investigate outcomes and complications of cataract surgery using clear corneal incision in patients taking antithrombotic medication.
Methods: We reviewed medical records of 156 eyes of 103 patients taking antithrombotic medication who underwent cataract surgery from January 2011 to July 2017. Patients underwent standard phacoemulsification through clear corneal incision, and topical anesthesia was performed before the surgery. The patients were divided into two groups based on the adjustment in medication: the continuation group (group C) and the discontinuation group (group D). The primary outcome was the incidence of hemorrhagic and thromboembolic complications, and the secondary outcomes were the change in best corrected visual acuity (BCVA) and incidence of perioperative ocular complications.
Results: The mean patient age was 69.7 ± 12.9 years and the proportion of female patients was 64.1% (66/103). Forty-five eyes were being treated with anticoagulants, 87 eyes with antiplatelet agents, and 24 eyes with a combined treatment. Group C comprised 68 eyes and group D comprised 88 eyes. There were no instances of serious hemorrhagic or thromboembolic complications in either group. In both groups, the BCVA increased significantly at one month after surgery (0.75 ± 0.81 to 0.18 ± 0.24 logMAR and 0.73 ± 0.71 to 0.26 ± 0.33 logMAR; p = 0.004 and 0.020, respectively) with no significant difference (p = 0.979). There was no significant difference between groups in the incidence of ocular complications such as posterior capsule rupture, corneal edema, and intraocular pressure elevation.
Conclusions: Patients taking antithrombotic medication could safely undergo cataract surgery without major complications regardless of the discontinuation of medication.
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Key Words: Anticoagulants or antiplatelet agents; Cataract extraction; Clear corneal incision; Perioperative complication

INTRODUCTION

Precise evaluation of medication before intraocular surgery is important because most such surgeries are performed in elderly patients who are taking medicines containing anticoagulants or antiplatelet agents for various systemic diseases (e.g., atrial fibrillation, heart valve disease, thromboembolism, and stroke).[1-3] Continued use of anticoagulants or antiplatelet agents might increase the risk of bleeding-related complications,[3-6] whereas the discontinuation of this medication can increase the risk of thromboembolism.[2,7-10] In particular, cataract surgery is the most commonly performed operation in the elderly,[11,12] necessitating the consideration of continuation of such medications before surgery.

Kobayashi[4] have reported that the incidence of subconjunctival hemorrhage was significantly higher in patients who underwent phacoemulsification while continuing to take warfarin or aspirin. Grzybowski and Packer[8] and Benzimra et al.[13] have also noted that there was no differ-

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ence in the incidence of major complications affecting visual prognosis, although there was an increase in the risk of some mild bleeding complications. In contrast, Bonhomme et al.[2] have reported that discontinuing the use of preoperative anticoagulants might increase the risk of life-threatening thromboembolic complications, exceeding the benefits of a decreased incidence of bleeding-related complications. Thus, there is still debate regarding the implications of the discontinuation of long-term anticoagulant or antiplatelet agent use.

Recent advances in surgical techniques have enabled cataract surgery using clear corneal incision and topical anesthesia. Intraoperative stability of the anterior chamber during surgery has increased, leading to a difference in the incidence rate of complications after cataract surgery as compared to that reported in previous studies.[8,14] Therefore, this study aimed to evaluate the outcomes and complications of cataract surgery using clear corneal incision on the basis of the continuation or discontinuation of antithrombotic medication.

MATERIALS AND METHODS

We retrospectively reviewed the medical records of consecutive patients who underwent cataract surgery from January 2011 to July 2017 and had been taking antithrombotic medication for more than 6 months. Patients with simple senile cataract who could undergo standard phacoemulsification through clear corneal incision were included in the study. Of the 192 eyes of 139 patients, eyes with mature cataract (n = 14), zonular weakness (n = 3), abnormal corneal condition (n = 1), abnormal lens or retinal conditions (n = 8 for age-related macular degeneration, n = 7 for severe non-proliferative diabetic retinopathy and proliferative diabetic retinopathy, n = 1 for recurrent uveitis), or a history of ocular surgery (n = 2 for vitrectomy) were excluded. This study was approved by Institutional Review Board of Inje University, Haeundae Paik Hospital (approval number: 2018-05-013-001).

Before the surgery, proparacaine HCl 0.5% solution (Alcaine®, Alcon, Fort Worth, TX, USA) was applied to the operating eye six times at 5-minute intervals for topical anesthesia. Subconjunctival or retrobulbar anesthesia was not performed. Five surgeons used the INFINITI® Vision System (with OZil® Intelligent Phaco software, Alcon, 2009) to perform cataract surgery using the standard phacoemulsification technique after a 2.2-mm or 2.8-mm clear corneal incision. The use of moxifloxacin eye drops (Vigamox®, Alcon) was sustained postoperatively, accompanied by dexamethasone (Maxidex®, Alcon) administration four times a day. The administration of both eye drops were gradually tapered along the postoperative period in the one-month follow up.

Patients were divided into two groups according to the continuation or discontinuation of medication before surgery: 1) group C (included those who continued the use of anticoagulants or antiplatelet agents), 2) group D (included those who discontinued the use of anticoagulants or antiplatelet agents before cataract surgery). The duration of drug discontinuation was determined after consultation with the department of cardiology or department of neurology. Surgery was performed with a steady intake of the medication if the risk of systemic thromboembolism due to drug discontinuation was high.

Baseline characteristics were noted, including age, gender, prothrombin time (PT)-international normalized ratio (INR), and medication state. The degree of lens opacity was classified according to Lens Opacities Classification System (LOCS) III. Best corrected visual acuity (BCVA, logMAR) and intraocular pressure (IOP) were reviewed at baseline and at one week, two weeks, and one month postoperatively. Intraoperative and postoperative complications were evaluated. Postoperative IOP elevation was defined as the IOP exceeding 20 mmHg or IOP elevation greater than 3 mmHg compared with the preoperative IOP. Hemorrhagic complications (e.g., hyphema, retinal hemorrhage, vitreous hemorrhage, suprachoroidal hemorrhage, and systemic hemorrhagic complications) and thromboembolic complications were investigated. Systemic hemorrhagic and thromboembolic complications were evaluated by review of the medical records of the department of cardiology or the department of neurology until one month after surgery.

The primary outcome was the incidence of hemorrhagic and thromboembolic complications. The secondary outcomes were the change in BCVA and the incidence of perioperative ocular complications. All statistical analyses were conducted using SPSS for Windows 17.0 (SPSS, Inc., Chicago, IL, USA). The Mann-Whitney *U* test was used for continuous variables, and the chi-squared test and Fisher's

exact test were used for categorical variables; statistical significance was set to a *p*-value of less than 0.05.

RESULTS

In total, 156 eyes of 103 patients were included in the study. The mean patient age was 69.7 ± 12.9 years, and 66 patients (64.1%) were female. Forty-five eyes were being treated with anticoagulants, 87 eyes were being treated with antiplatelet agents, and 24 eyes were being treated with a combined treatment. The most common reason for the use of antithrombotic medication was myocardial infarction with a history of percutaneous transluminal coronary angioplasty (PTCA) (48.3%), followed by stroke (31.8%), uncomplicated atrial fibrillation (16.2%), a history of heart valve operation (10.6%), and hypertension (8.7%).

Group C comprised 68 eyes of 40 patients (29 females, 11 males) with a mean patient age of 67.0 ± 16.0 years. Group D comprised 88 eyes of 63 patients (37 females, 26 males) with a mean patient age of 72.2 ± 8.5 years. Preoperative BCVA (logMAR) was 0.75 ± 0.81 for group C and 0.73 ± 0.71 for group D (p = 0.930). The degree of lens opacity was 2.87 ± 0.69 for group C and 2.46 ± 0.75 for group D (p = 0.058). Preoperative PT-INR was significantly higher in group C (1.22 ± 0.44) than in group D (1.04 ± 0.20) (p = 0.023); there were no other significant differences between the two groups (Table 1). In group D, the mean duration of cessation was 2.89 ± 10.36 days for anticoagulants, 3.98 ± 21.79 days for antiplatelet agents, and 6.15 ± 12.41 days for combined therapy, which varied according to the patients' comorbidity (Fig. 1).

There were no instances of hyphema; retinal, vitreous, or suprachoroidal hemorrhage; or systemic hemorrhagic complications during the perioperative period. There were also no instances of thromboembolic complications, including angina attacks, aggravation of coronary artery occlusive disease, brain infarction or brain hemorrhage, or pulmonary embolism, at the one month follow-up in both groups.

In both groups, preoperative BCVA (logMAR) significantly improved through one week, two weeks and one month post-operation. In group C, BCVA improved from 0.75 ± 0.81 to 0.31 ± 0.29 at one week, 0.21 ± 0.28 at two weeks, and 0.18 ± 0.24 at one month (p = 0.029, 0.018, 0.004, respectively) post-operation. In group D, BCVA improved from 0.73 ± 0.71 to 0.35 ± 0.35 at 1 week, 0.29 ± 0.33 at 2 weeks, and 0.26 ± 0.33 at 1 month (p = 0.039, 0.025, 0.020, respectively) post-operation (Fig. 2). There was no significant difference in the amount of visual acuity improvement at all postoperative timepoints in both groups (p = 0.254-0.329).

Table 1. Baseline characteristics of patients taking antithrombotic medication according to continuation (group C) or discontinuation (group D) of medication

Parameter	Group C	Group D	*p*-value
Patients/eyes	40/68	63/88	
Age (years)	67.0 ± 16.0 (45-83)	72.2 ± 8.5 (57-81)	0.136*
Sex			
Female	29 (72.5)	37 (58.7)	0.207†
Male	11 (27.5)	26 (41.3)	
Preoperative BCVA (logMAR)	0.75 ± 0.81	0.73 ± 0.71	0.930*
Nuclear sclerosis‡	2.87 ± 0.69	2.46 ± 0.75	0.058*
Administration			
Anticoagulants	18 (26.4)	27 (30.7)	
Antiplatelet	39 (57.4)	48 (54.5)	0.339§
Combined	11 (16.2)	13 (14.8)	
PT-INR	1.22 ± 0.44	1.04 ± 0.20	0.023*

Values are presented as mean ± standard deviation (range) or number (%).
BCVA = best corrected visual acuity; logMAR = logarithm of minimal angle of resolution; PT-INR = prothrombin time international normalized ratio.
*Mann-whitney *U*-test; †Fisher's exact test; ‡classified according to Lens Opacities Classification System III; §Pearson chi-square test.

In group C, four instances of posterior capsule rupture (PCR) (11.8%), four instances of postoperative IOP elevation (11.8%), and one instance of corneal edema (2.0%) occurred. In group D, five instances of PCR (6.7%), two instances of postoperative IOP elevation (2.7%), and one instance of corneal edema (1.3%) occurred; there were no significant differences in the incidence of these complications between groups (p = 0.516, 0.109, 0.645, respectively) (Table 2). In both groups, PCR was the most common non-hemorrhagic complication. Every instance of IOP spike and corneal edema subsided within one month post-operation. No additional procedure was needed for PCR.

DISCUSSION

The most common causes of anticoagulant or antiplatelet use are atrial fibrillation or prosthetic valve surgery.[9,15] The other causes include repetitive venous thromboembolism, ischemic heart disease, or cerebral infarction.[9] The incidence of these diseases is on the increase among elderly patients, leading to an increase in the use of anticoagulants or antiplatelet agents in patients undergoing simple senile cataract surgery. Several studies have been conducted to develop safe elective surgical procedures while minimizing bleeding in patients taking anticoagulants or antiplatelet agents.

Douketis et al.[16] recommend cessation of the use of anticoagulants based on the American College of Chest Physician's anticoagulation policy, which is as follows: 1) continue intake of vitamin K antagonist if the patient is on aspirin, 2-1) continue intake of antithrombotic medication of any kinds for prevention of cardiovascular disease, 2-2)

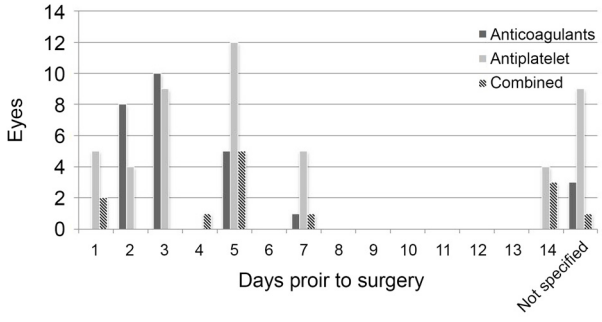

Figure 1. Duration of cessation of antithrombotic medication in patient underwent cataract surgery.

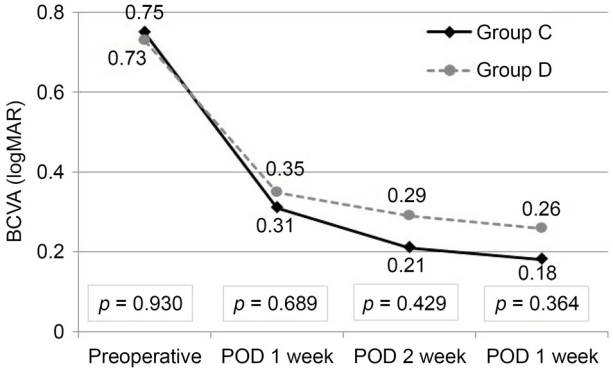

Figure 2. Best corrected visual acuity (BCVA, logMAR) change after cataract surgery in patients taking antithrombotic medication depending on continuation (group C) or discontinuation (group D) of medication. p-values of comparison of BCVA between groups at each period are presented in square boxes. POD = postoperative date; logMAR = logarithm of minimal angle of resolution.

Table 2. Postoperative non-hemorrhagic and hemorrhagic complications in patients taking antithrombotic medication depending on continuation (group C) or discontinuation (group D) of medication

Complication	Group C (68 eyes)	Group D (88 eyes)	p-value*
Non hemorrhagic			
Intraoperative			
CCC tear	0	0	
PC rupture	4 (5.9)	5 (5.7)	1.000
Postoperative			
IOP spike	5 (7.4)	8 (9.1)	0.777
Corneal edema	1 (1.5)	3 (3.4)	0.633
Hemorrhagic	0	0	

Values are presented as number (%).
CCC = continuous curvilinear capsulotomy; PC = posterior capsule; IOP = intraocular pressure.
*Fisher's exact test.

continue intake of antithrombotic medication of any kinds if at moderate-to-severe risk of cardiovascular disease, and 2-3) stop antithrombotic medication intake if at a lower risk of cardiovascular disease. However, these guidelines recommend a regimen of oral intake of medication based on the risk of cardiovascular disease, without considering differences in surgical technique or preoperative anesthesia methods. Therefore, it is difficult to apply these guidelines without adjustment to patients considering cataract surgery, which has a minimal risk of bleeding.

The incidence of preoperative and postoperative complications due to the use of hemorrhagic drugs varies depending on the differences in anesthetic methods (e.g., general anesthesia, retrobulbar anesthesia, periocular anesthesia, sub-tenon anesthesia, topical anesthesia) and surgical techniques (e.g., extracapsular cataract extraction, phacoemulsification).[9] However, cataract surgery is now an almost non-vascular procedure that uses clear corneal incision under topical anesthesia.[7] Consequently, it is preferred to conduct cataract surgery under the continued use of hemorrhagic drugs because the risk of systemic thromboembolic complications is considered to be higher than the risk of hemorrhagic complications.[3,7,9,17,18] There is no definite recommendation of whether it would be safe to stop drug intake for a certain time period for a certain level of cardiovascular risk.

Benzimra et al.[19] studied 55,567 patients who underwent cataract surgery in 12 institutes in the United Kingdom from 2001 to 2006 and classified these patients into a group who continued anticoagulant or antithrombotic agent intake during surgery (maintenance group) and a group who did not take any medication. In their study, the maintenance group showed a significantly greater incidence of only subconjunctival hemorrhage, and the rate of PCR was significantly higher in the clopidogrel-treated group. Subconjunctival hemorrhage occurred owing to the use of a sharp needle or sub-tenon cannula (2.0% in the aspirin group, 4.39% in the clopidogrel group, 3.67% in the warfarin group, 0.92-6.58% in the combination group), though the corresponding incidence was 10 times lower than that in previous studies.[19] In the aspirin-sustained group, the prognosis of visual acuity tended to be poor although not statistically significant. Because patients who were administered topical anesthesia or anterior chamber anesthesia were excluded to prevent bias, the results of this study might be different from those of our study, which only focused on patients treated with topical anesthesia. Some studies have reported that the incidence of hemorrhagic complications significantly increased when anticoagulants or antiplatelet agents were continuously administered before and after cataract surgery.[6] As these hemorrhagic complications usually involve mild bleeding unrelated to vision, such as subconjunctival hemorrhage, most studies claim that the use of anticoagulants or antiplatelet agents does not increase the risk of severe hemorrhagic complications after cataract surgery that could affect visual acuity.[1-4,7,14,19] In this study, there was also no significant difference in the incidence of major complications due to the discontinuation of anticoagulants or antiplatelet agents, and no bleeding-related complications occurred in both the continued and discontinued groups. This is thought to be owing to the recent developments in surgical instruments and techniques.

A peculiarity of this study is that the duration of drug withdrawal varied from the preoperative period to the postoperative period owing to the retrospective design of the study. The most frequent duration of discontinuation of medication was 3 days and 5 days, which showed a similar distribution as that noted in a previous study conducted by Batra et al.[9] The mean duration of cessation tends to be longer in combined therapy group due to relatively chronic stabilized underlying conditions in combined therapy group and more severe comorbidity in anticoagulant administration group (e.g., heart valve operation). Personalized preoperative management was performed as the duration of discontinuation of medication was decided by the specialized medical department considering the severity of the patient's comorbidity and risk of thromboembolism. Consequently, no serious bleeding-related complications occurred even in patients who underwent cataract surgery under the continued intake of anticoagulants or antiplatelet agents. In addition, topical anesthesia was the only anesthetic method in this study, excluding a needle- or cannula-related complication as a consequence. Therefore, complications induced only by cataract surgery itself could be selectively reviewed.

A limitation of this study is the lack of investigation of mild hemorrhagic complications such as subconjunctival hemorrhage owing to the retrospective nature of the study. Subconjunctival hemorrhage is most common hemorrhagic

complication in cataract surgery and its instances should be documented. Also, current study lacks the control group who were not on routine antithrombotic agents. The criteria for the discontinuation of medication are unclear, and the duration of discontinuation varies because it was decided after consultation. In addition, long-term follow up over 6 months could not be managed as the study population only included cases of simple uncomplicated senile cataract.

Nonetheless, this study suggests that cataract surgery can be safely performed without major vision-threatening hemorrhagic, non-hemorrhagic, and systemic complications in patients taking anticoagulants or antiplatelet agents. In conclusion, patients taking anticoagulants or antiplatelet agents could undergo cataract surgery using clear corneal incision regardless of the continuation or discontinuation of drugs.

REFERENCES

1) Grzybowski A, Ascaso FJ, Kupidura-Majewski K, Packer M. Continuation of anticoagulant and antiplatelet therapy during phacoemulsification cataract surgery. Curr Opin Ophthalmol 2015;26:28-33.
2) Bonhomme F, Hafezi F, Boehlen F, Habre W. Management of antithrombotic therapies in patients scheduled for eye surgery. Eur J Anaesthesiol 2013;30:449-54.
3) Katz J, Feldman MA, Bass EB, et al. Risks and benefits of anticoagulant and antiplatelet medication use before cataract surgery. Ophthalmology 2003;110:1784-8.
4) Kobayashi H. Evaluation of the need to discontinue antiplatelet and anticoagulant medications before cataract surgery. J Cataract Refract Surg 2010;36:1115-9.
5) Kara-Junior N, Santhiago MR, Almeida HG, Raiza AC. Safety of warfarin therapy during cataract surgery under topical anesthesia. Arq Bras Oftalmol 2015;78:173-4.
6) Gainey SP, Robertson DM, Fay W, Ilstrup D. Ocular surgery on patients receiving long-term warfarin therapy. Am J Ophthalmol 1989;108:142-6.
7) Barequet IS, Sachs D, Shenkman B, et al. Risk assessment of simple phacoemulsification in patients on combined anticoagulant and antiplatelet therapy. J Cataract Refract Surg 2011;37:1434-8.
8) Grzybowski A, Packer M. Anticoagulant and antiplatelet therapy during ocular surgery. Br J Ophthalmol 2014;98:1137-8.
9) Batra R, Maino A, Ch'ng SW, Marsh IB. Perioperative management of anticoagulated patients having cataract surgery: national audit of current practice of members of the Royal College of Ophthalmologists. J Cataract Refract Surg 2009;35:1815-20.
10) Kara-Junior N, Koch CR, Santhiago MR, et al. Anticoagulants and antiplatelet drugs during cataract surgery. Arq Bras Oftalmol 2018;81:348-53.
11) Hodge W, Horsley T, Albiani D, et al. The consequences of waiting for cataract surgery: a systematic review. CMAJ 2007;176:1285-90.
12) DCCT/EDIC Research Group, Aiello LP, Sun W, et al. Intensive diabetes therapy and ocular surgery in type 1 diabetes. N Engl J Med 2015;372:1722-33.
13) Benzimra M, Bonnamour B, Duracinsky M, et al. Real-life experience of quality of life, treatment satisfaction, and adherence in patients receiving oral anticoagulants for atrial fibrillation. Patient Prefer Adherence 2018;12:79-87.
14) Barequet IS, Sachs D, Priel A, et al. Phacoemulsification of cataract in patients receiving coumadin therapy: ocular and hematologic risk assessment. Am J Ophthalmol 2007;144:719-23.
15) Konstantatos A. Anticoagulant and cataract surgery: a review of the current literature. Anaesth Intensive Care 2001;29:11-8.
16) Douketis JD, Spyropoulos AC, Spencer FA, et al. Perioperative management of antithrombotic therapy: antithrombotic therapy and prevention of thrombosis, 9th ed: American college of chest physicians evidence-based clinical practice guidelines. Chest 2012;141(2 Suppl):e326S-50S.
17) Moll AC, van Rij G, van der Loos TL. Anticoagulant therapy and cataract surgery. Doc Ophthlamol 1989;72:367-73.
18) Kong KL, Khan J. Ophthalmic patients on antithrombotic drugs: a review and guide to perioperative management. Br J Ophthalmol 2015;99:1025-30.
19) Benzimra JD, Johnston RL, Jaycock P, et al. The cataract national dataset electronic multicentre audit of 55,567 operations: antiplatelet and anticoagulant medications. Eye (Lond) 2009;23:10-6.