

(01)

A retrospective analysis of the intraocular lens power calculation in cases of sulcus fixation

Retrospektywna analiza kalkulacji mocy soczewek wewnątrzgałkowych umieszczonych w bruzdzie rzęskowej

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Summary:

Purpose: To evaluate the refractive results in patients with intraocular lenses fixated in the sulcus of posterior chamber. Sulcus fixation causes a more anterior position of IOL than had been intended during the preoperative power calculation. A lack of correction of the IOL's power results in a myopic shift.

Material and methods: 27 patients (27 eyes) who underwent cataract surgery by phacoemulsification and foldable IOL MA60BM sulcus fixation due to a posterior capsule rupture at the Department of Ophthalmology, Medical University of Warsaw. The position of the IOL was confirmed by ultrabiomicroscopy. The study included patients with axial lengths ranging from 22 to 25 mm. Patients who suffered from a corneal astigmatism of $> 1,00$ Dcyl prior to the surgery were excluded from the study. The study also excluded patients with vitreous loss as this causes the anterior chamber to become deeper after vitrectomy, and consequently the IOL might sit in a more posterior position. The difference between the predicted and the postoperative refraction was evaluated.

Results: The mean visual acuity was significantly better after cataract surgery. The best corrected visual acuity (BCVA) was 1.0, which occurred in 19 cases (70%). The myopic shift, which was assessed as a mean difference between the predicted and the postoperative refraction after sulcus fixation, was 1.25 D.

Conclusions: In order to avoid a myopic shift in the case of sulcus fixation, the IOL power calculation should be adjusted accordingly. The authors recommend that the IOL power should be reduced by approximately 1.25 to 1.50 D in emetropic eyes.

Słowa kluczowe:

operacja zaćmy, wszczep do bruzdy rzęskowej, przerwanie torebki tylnej, soczewka wewnątrzgałkowa.

Key words:

cataract surgery, sulcus fixation, posterior capsule rupture, intraocular lens.

Introduction

Cataract surgery by phacoemulsification is a well-established operative technique. In order to provide excellent visual acuity and improve the safety of surgical procedures by decreasing complications and shortening the rehabilitation period, the cataract extraction is made by micro incision which is followed by the insertion of a foldable IOL using injectors.

One of the possible capsular complications that occur during phacoemulsification, is a rupture of the posterior capsule, which can lead to vitreous loss. In this case, the intraocular lens (IOL) usually cannot be implanted in the bag but has to be implanted in the ciliary sulcus instead (1). Sulcus fixation results in a more anterior position of IOL than had been intended during the preoperative power calculation (2,3). Moreover, an anterior chamber deepens in eye after vitrectomy due to the lack of the bulk and pressure of the vitreous (4). If the IOL power is not adjusted, a myopic shift occurs. During sulcus fixation, the surgeon usually empirically reduces the IOLs power.

The aim of our study was to evaluate the refractive results in patients with sulcus fixated posterior chamber intraocular

lenses (IOL), as a result of posterior capsule rupture, and to determine the appropriate IOL power reduction in such cases.

Material and methods

In this retrospective study we considered patients who underwent cataract surgery by phacoemulsification at the Department of Ophthalmology at Medical University of Warsaw between January 2005 and June 2007, and had sulcus fixation of the foldable IOL due to a rupture of the posterior capsule.

Patients with concomitant eye diseases, which may affect their visual function, were excluded from the study. Also, patients with a corneal astigmatism of > 1 Dcyl prior to surgery, were excluded from the study.

The study group consisted of 27 patients (27 eyes) – 17 women and 10 men. The study included patients with axial lengths ranging from 22 to 25 mm. The IOL power calculation was performed using the partial coherence interferometry method (IOL Master, Zeiss). The IOLs power was calculated using the SRK/T formula.

The phacoemulsifications were performed by 3 senior surgeons, all through a clear corneal incision and all under peribulbar

anesthesia. In all cases, a 3 piece acrylic IOL (MA60BM, Alcon), was fixated in the sulcus due to a posterior capsule rupture. In order to avoid the inaccuracy of the additional myopic shift, the study excluded patients who experienced vitreous loss.

Six months after the surgery, the postoperative refraction was evaluated in all eyes using an autokeratorefractometer (Speedy 1 Nikon 31002), and then confirmed by subjective refraction. The IOLs position was confirmed by ultrabiomicroscopy (UBM).

The refractive shift was determined as the difference between the refraction after sulcus fixation (spherical equivalent, SE) and the calculated refraction prior to the surgery.

Results

The study group consisted of 27 patients (27 eyes) – 17 women and 10 men in age 65-86 years (mean 70.21). Surgery was performed in the right eye of 15 patients and left eye of 12 patients (Tab. I).

Characteristic	Result
Mean age (years)	70.21 ± 8.92
Sex (M/F)	10/17
Eye (L/R)	12/15
Mean axial length (mm)	23.41 ± 0.73
Mean planned IOL power (D)	22.25 ± 2.12
Mean predicted refraction (D)	-0.21 ± 0.14

Tab. I. Clinical characteristics of the patients.

Tab. I. Charakterystyka grupy pacjentów.

Means ± SD
L – left, R – right

Early postoperative complications included IOP elevation (6 cases), corneal edema (4 cases), and increased inflammation in the anterior chamber (4 cases). In 18 months observations no serious postoperative complications, such as retinal detachment, were found.

Table II shows the mean preoperative and postoperative visual acuities. The mean visual acuity had significantly improved after cataract surgery (p<0.001, paired t test). The best corrected visual acuity (BCVA) was 1.0, which occurred in 19 cases (70%).

	BCVA
Mean preoperative visual acuity	0.5 ± 0.21
Mean postoperative visual acuity	0.63 ± 0.13

Tab. II. Mean preoperative and postoperative visual acuities.

Tab. II. Średnia ostrość wzroku przed zabiegiem i po zabiegu.

	Myopic shift (D)	N	p
Axial length 22-25 mm	1.24 ± 0.685	27	<0.001 ^a

Tab. III. Difference between the predicted and postoperative refraction after sulcus fixation.

Tab. III. Różnica między refrakcją przewidywaną a refrakcją po wszczępieniu implantu do bruzdy rzęskowej.

^a paired t test

The myopic shift, which was assessed as a mean difference between the predicted and the postoperative refraction after sulcus fixation, was 1.25 D (Tab. III).

Discussion

Nowadays, patients are generally more demanding than they were in the past and they expect a high level of visual acuity and comfort following cataract surgery. This surgical procedure also allows the correction of refractive errors. One of the possible intraoperative complications during cataract surgery is a posterior capsule rupture, which often hinders the surgeon from an in-the-bag implantation of the IOL. In these cases, the IOL should be placed in the ciliary sulcus. Due to a more anterior position of the implant, a myopic shift from the predicted value occurs (2,3).

In order to determine the myopic shift after sulcus fixation, we restricted our study to phacoemulsification with clear corneal incision, the same type of foldable intraocular lens (MA60BM, Alcon, 3-piece acrylic IOL), and eyes where the axial length is between 22 and 25 mm and the corneal astigmatism is no more than 1 Dcyl. In order to exclude cases with dislocated IOLs, their position in the ciliary sulcus was assessed by the use of ultrabiomicroscopy in every case.

In our study we excluded patients who encountered vitreous loss, as this causes the anterior chamber to become deeper and so horizontal elongation may be expected (4).

We found that the value of the mean myopic shift was approximately 1.25 D and consequently, we suggest that the IOL power should be reduced by approximately 1.25 to 1.50 D. Bayramlar et al also concluded that the IOL power should be reduced by 1.25 to 1.50 D (5). In contrast to our findings, Hayashi et al. recommended reducing the IOL power by 0.50 D (6), while Suto et al. suggested that for in-the-bag fixation in eyes with a normal axial length, the IOL power should be reduced by 1.00 D from the original calculation (7). However, it should be emphasized, that although the afore mentioned authors gave distinctly precise inclusion criteria, their types of IOL were not consistent, their study groups relatively small and the IOLs positions in the ciliary sulcus was not confirmed by UBM.

Our study consisted of patients with axial lengths ranging from 22 to 25 mm. Axial length influences the IOL power (8). Suto et al. suggested a theoretical reduction of 1.50 to 2.00 D for short eyes and 0.50 D through to none for long eyes (7). We recommend that in cases of IOL sulcus fixation after a posterior capsule rupture, the IOL power should be reduced by approximately 1.25 to 1.50 D for emetropic eyes. The best corrected visual acuity was significantly better following cataract surgery in all cases, despite experiencing such intraoperative complications. In these cases, an appropriate correction of the myopic shift, would have brought about significant improvements in the patients' well-being.

Conclusions

In order to avoid a myopic shift in the case of sulcus fixation, the IOL power calculation should be adjusted. The authors recommend that the IOL power should be reduced by approximately 1.25 to 1.50 D for emetropic eyes.

The authors had no financial or proprietary interest in any product, material or method mentioned herein.

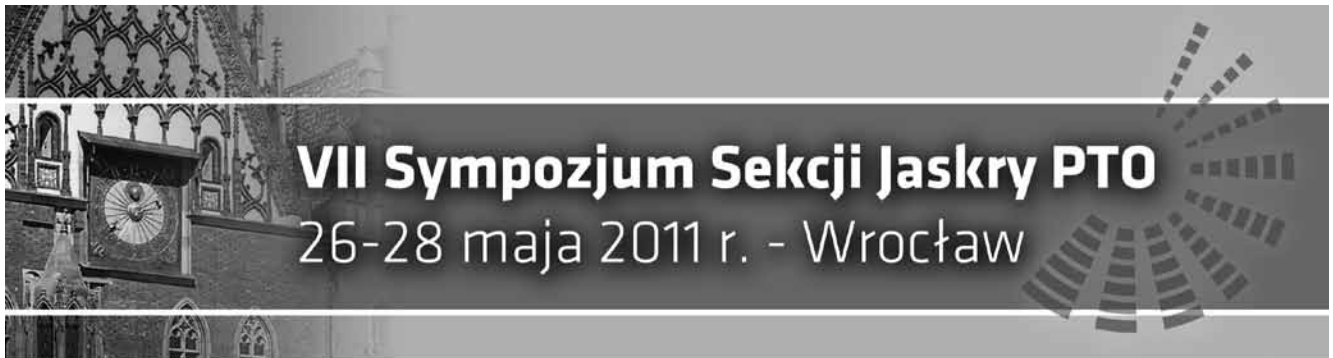
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Serdecznie zapraszamy do udziału w VII Sympozjum Sekcji Jaskry PTO we Wrocławiu w dniach 26-28 maja 2011 r. Gorąco zachęcamy do tworzenia programu naukowego poprzez zgłaszanie prac, na które czekamy do 31 marca 2011 r. Szczegółowe informacje na www.glaucoma2011.pl

Prof. dr hab. Marta Misiuk-Hojło

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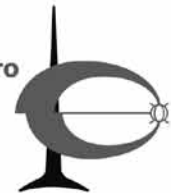
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