

8. Streszczenie w języku angielskim

Introduction

The World Health Organisation defines a cataract as a clouding of the lens of the eye, which leads to a decrease in vision and is usually age-related. The only effective method of treatment of a cataract is an implant of an artificial intraocular lens during a surgery. A cataract together with refractive errors are the most common causes of a decrease in vision in the whole world and as a result a cataract surgery has become the most common surgical treatment in developed countries. Formulas calculating the power of artificial intraocular lens for an emmetropic eye guarantee required refractive outcomes. Calculating the power of the lens implant for hypermetropic and myopic eyes is often problematic and the outcomes are not always satisfactory, neither for the patient nor for the doctor. Therefore, it is essential to discuss the problem of a retrospective analysis of the changes in refraction after a cataract surgery by phacoemulsification depending on the selected parameters of an eye.

The objective

The objective of the study was to analyse the changes in refraction after a cataract surgery by phacoemulsification.

The specific goals included:

The assessment of the refractive error after a cataract surgery in relation with the length of the eyeball.

The assessment of stabilisation of refraction after a cataract surgery.

The assessment of the refractive error and the change in refraction after a cataract surgery in relation with the depth of the anterior chamber.

The assessment of changes in the values of intraocular pressure after a cataract surgery.

The assessment of the refractive error after a cataract surgery in relation with the model of the implanted lens.

Methods and materials

The study was conducted on a group of 90 patients, 29 men and 61 women, aged between 46 and 85, the average age was 71,63. All the patients were diagnosed with a cataract which was removed by phacoemulsification and an artificial lens was implemented. The intraocular lenses implanted were produced by Bausch (Akreos AO) or Rayner (C-flex). There were no complications during or after the surgery.

Inclusion criteria

- 30 hypermetropic patients with a cataract and with the length of the eyeball shorter than 22 mm.
- 30 emmetropic patients with a cataract and with the length of the eyeball between 22 mm and 24 mm.
- 30 myopic patients with a cataract and with the length of the eyeball longer than 24 mm.
- the patients' consent to participate in the study.

Exclusion criteria

- diseases of the anterior segment of the eye, e.g. pterygium, corneal scars,
- previous eye injuries,
- myopic patients with major changes in central retina.
- patients with optic nerve disorders,

- patients after a vitrectomy surgery,
- complications during and after the surgery.

The studied patients were divided in the following groups:

Group I: emmetropic patients with the length of the eyeball between 22 mm and 24 mm; 21 women and 9 men, aged between 46 and 83, the average age was 71.

Group II: hypermetropic patients with the length of the eyeball shorter than 22 mm; 24 women and 6 men, aged between 55 and 85, the average age was 74.

Group III: myopic patients with the length of the eyeball longer than 24 mm; 16 women and 14 men, aged between 48 and 83, the average age was 72,5.

Results

In the material analyzed by me the average of the best corrected visual acuity for distance and near 3 weeks and 3 months after the surgery was 1,0 and 0,5 on the Snellen scale respectively.

The stabilization of refraction within ± 0.5 D spherical in the third week was obtained in the group of emmetropic patients (91%), myopic patients (77%) and hypermetropic patients (46%). The percentage distribution within ± 0.75 D spherical looks as follows: emmetropic patients – 94%, myopic patients - 94%, hypermetropic patients - 80%. The change of spherical equivalent below 0,25 D spherical was observed in 57% of patients ($p < 0,003$). The fastest stabilization of refraction was observed in the group of emmetropic patients.

In the conducted research I demonstrated a correlation between the value of the ACD before the surgery and value of ACD after the surgery. The bigger the initial value of the ACD, the smaller the change in the ACD after the operation ($p < 0,001$). In my research I did not observe any correlation between the ACD before a surgery and a refraction shift after a cataract surgery ($p = 0,215$). Neither did I observe any relationship between the change of the ACD after a cataract surgery and a refractive

shift after a cataract surgery ($p=0,318$). However, there is a noticeable trend of a refractive shift towards hypermetropia in hypermetropic patients after a surgery.

The analysis of intraocular pressure after a cataract surgery did not show any changes in its value three weeks after the operation. In the third month an average decrease of 2 mmHg in intraocular pressure was noticed in all three the above mentioned groups. There is a noticeable regularity that the higher the initial value of intraocular pressure is, the higher the decrease in its value after phacoemulsification.

The obtained refractive result was analyzed after a cataract surgery. The absolute error, which means the absolute value of particular deviations, was assessed. The obtained MAE was 0,47 Dsph for emmetropic patients, 0,38 Dsph for hypermetropic patients and 0,41 Dsph for myopic patients. I did not observe any statistically significant differences between the studied groups ($p=0,503$). MAE for all the studied population was 0,42 Dsph where 64% of the patients achieved the targeted refraction with MAE of 0,5 Dsph and for 88% MAE was 1 Dsph.

I analyzed MAE and the depth of the anterior chamber before the operation in each of the three groups. I did not notice any correlation between the analyzed parameters ($p>0,5$).

In the study I also analyzed the influence of the lens model on MAE after a surgery. The lenses implanted were acrylic and hydrophilic lenses produced by Bausch (Acreos AO) and Rayner (C-flex).

The lenses differ in shape and the number of haptics. Acreos has 4 small haptics, whereas C-flex has two longer ones on the opposite sides. The observed differences in MAE between particular groups were not statistically significant.

Conclusions

1. The application of optical biometry and Barrett Universal II formula for power calculations of lens implantation allows achieving proper refraction after a surgery for any length of an eyeball.

2. Refraction after a cataract surgery stabilizes as early as three weeks after the operation for emmetropic patients.

3. The depth of the anterior chamber (ACD) plays an essential role in predicting the refraction after a cataract surgery. There is a noticeable tendency towards a hypermetropic shift when the change in the ACD is bigger and there is a higher chance of a myopic shift if the change in the ACD is smaller.

4. Intraocular pressure stabilizes already in the third month after a cataract surgery and an average decrease in the value of the pressure is 2,5 mmHg. The higher the value of intraocular pressure before the operation, the bigger the decrease in intraocular pressure after the operation.

5. The type of one-piece intraocular lens haptics does not affect refractive error development after a cataract surgery.