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Incidence and functional outcome of phacoemulsification complicated by posterior capsular rupture

Wyniki czynnościowe fakoemulsyfikacji zaćmy powikłanej pęknięciem torby tylnej soczewki

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Summary:

Purpose: To evaluate retrospectively anatomic and functional results of phacoemulsification with posterior chamber intraocular lens implantation, complicated by intraoperative posterior capsular rupture (PCR).

Material and methods: Data were gathered from medical records of 930 patients (one thousand eyes), who underwent phacoemulsification. The examined group consisted of 52 eyes of 52 patients, 27 women (52%), and 25 men (48%), 50 to 84 years old (mean age 73.52 ± 7.8), who underwent phacoemulsification complicated by intraoperative posterior capsular rupture.

The control group consisted of 427 patients, including 263 women (61.59%) and 164 men (38.41%), at the age 44 to 93 (mean age 70.3 ± 10.2), who underwent uncomplicated cataract phacoemulsification.

All patients had ophthalmic examination preoperatively, one day postoperatively and 10 to 14 days postoperatively. The evaluated data included: patients' age and gender, pre- and postoperative best corrected visual acuity, intraocular pressure, state of the anterior and posterior segment, early postoperative complications, type of implanted intraocular lens and whether anterior vitrectomy was performed. Nonparametric tests were used for statistical analysis (Wilcoxon signed-ranks test and Mann-Whitney U test).

Results: A statistically significant difference in postoperative BCVA between both groups was found. Mean postoperative BCVA in the PCR group was 0.63 ± 0.27 , whereas mean postoperative BCVA in the reference group was 0.78 ± 0.18 ($p < 0.001$). Ten patients in the PCR group (19%), required anterior vitrectomy.

In-the-bag implantation was performed in all eyes from the reference group, but it constituted only 31% (16 eyes), of the PCR group. We found that eyes with PCR are 2.6 times more likely to develop other intraoperative complications and early postoperative complications in comparison with controls. In our study eyes with PCR were about 5 times more likely to have a final BCVA worse than 0.5 than eyes from uncomplicated surgery group.

Conclusions: Eyes with intraoperative PCR during phacoemulsification have a higher risk of reduced BCVA, however, it is possible to achieve good final BCVA in the majority of eyes. Appropriate intraoperative and postoperative management will usually allow to perform a successful procedure with safe placement of an intraocular lens, thus ensuring a relatively favourable outcome.

Key words:

Stowa kluczowe:

zaćma, fakoemulsyfikacja, wyniki, powikłania, pęknięcie torby tylnej soczewki

Introduction

From time to time every cataract surgeon will encounter some complications in his practice. Posterior capsular rupture (PCR) is a relatively frequent and significant complication that most surgeons have to face, especially during the learning period. Its incidence decreases with the increasing experience of the surgeon, however, PCR is sometimes encountered even by the most experienced ophthalmologists. Capsular rupture is a recognised risk factor of cystoid macular oedema and retinal detachment, and therefore it is a risk factor of reduced final postoperative visual acuity (1,2,3).

We have retrospectively examined a consecutive series of patients undergoing phacoemulsification complicated by PCR

and compared the results with a reference group with intact posterior capsule.

The purpose of the study was to retrospectively evaluate anatomic and functional results of phacoemulsification of cataract with intraocular lens implantation, complicated by intraoperative posterior capsular rupture.

Materials and methods

The evaluated data were gathered from medical records of 930 patients (one thousand eyes), who underwent phacoemulsification of cataract between June 2002 and June 2003 in the Department of Ophthalmology, Medical University of Lodz, Poland. All surgeries were performed by two experienced surgeons.

We reviewed manually 930 case histories in order to extract data for further evaluation. In order to eliminate the influence of co-morbidity on the results, patients with history of other present or previous ocular disease, previous intraocular surgery, as well as patients undergoing combined procedures were excluded from the study. We have found 52 eyes with intraoperative posterior capsular rupture (PCR), in the records, which constitutes 5.2% of all reviewed patient documentation.

All patients from both groups were operated using a "Divide and Conquer" technique with an Oertli phaco machine, utilising a peristaltic pump. All patients were operated under local (peribulbar) anaesthesia.

The examined group (Group I), consisted of 52 eyes (52 patients), including 27 women (52%) and 25 men (48%), at the age ranging from 50 to 84 years old (mean age 73.5 ± 7.8), who underwent phacoemulsification complicated by intraoperative posterior capsular rupture.

All patients from Group I had a scleral tunnel incision 5.5mm to 6.0mm wide, which was closed with a cross-running suture. All patients received a one-piece rigid all-PMMA intraocular lens. None of the patients from this group had any intraocular surgery in this eye before, nor did they have any coexisting ocular disease.

The control group (Group II) consisted of all patients who underwent uneventful surgery, who were operated in the same period using the same technique as patients from PCR group. For this reason, this group was much larger and consisted of 427 patients, including 263 women (62%) and 164 men (38%), at the age 44 to 93 (mean age 70.3 ± 10.2).

All patients from the control group underwent uncomplicated cataract phacoemulsification through a 5.5mm or 6.0mm wide scleral tunnel closed with a cross-running suture, with a one-piece rigid all-PMMA intraocular lens implanted in-the-bag and had intact posterior capsule. Patients from this group have never had any intraocular surgery in this eye before, they also did not have any coexisting ocular disease.

The difference in numbers of analysed cases between both groups arises from the fact that all patients without co-morbidity, who were operated in the same period with the same technique using the same equipment were included in the study. All patients had ophthalmic examination preoperatively, one day postoperatively and 10 to 14 days postoperatively. The evaluated data included: patients' age and gender, pre- and postoperative best corrected visual acuity (BCVA), intraocular pressure, state of the anterior and posterior segment, early postoperative complications and type of implanted intraocular lens. We also noted whether anterior vitrectomy was performed. Patients undergoing combined procedures were excluded from the study.

Nonparametric tests were used for statistical analysis. Calculations were performed for the level of significance $\alpha = 0.05$ using Microsoft Excel software. Changes of pre- and postoperative values in the same group were compared using Wilcoxon signed-ranks test and statistical significance between two groups was determined using Mann-Whitney U test.

Results

Figure 1 shows pre- and postoperative best corrected visual acuity in both groups. There was a significant postopera-

tive increase in BCVA in both groups (Wilcoxon T test: PCR group $p < 0.0001$, the reference group $p < 0.0001$). We also found a significant difference in preoperative BCVA between the groups (Mann-Whitney U test: $p < 0.05$). Mean preoperative BCVA in the PCR group was 0.20 ± 0.19 whereas mean preoperative BCVA in the reference group was 0.26 ± 0.21 . Despite apparent similarity, the difference proved to be significant.

In the PCR group BCVA improved in 45 eyes (86.5%), did not change in 5 eyes (9.6%) and decreased in 2 eyes (3.9%). The two eyes with decreased postoperative BCVA were: one eye with retinal detachment and one eye after vitreous loss and anterior vitrectomy where BCVA decreased from 0.3 before the surgery to 0.1 postoperatively due to cystoid macular oedema. In the reference group BCVA improved in 412 eyes (96.5%) and did not change in 15 eyes (3.5%). There were no cases of postoperative decrease of BCVA in this group.

Moreover, we observed a statistically significant difference in postoperative BCVA between both groups (Fig. 1). Mean postoperative BCVA in the PCR group was 0.63 ± 0.27 whereas mean postoperative BCVA in the reference group was 0.78 ± 0.18

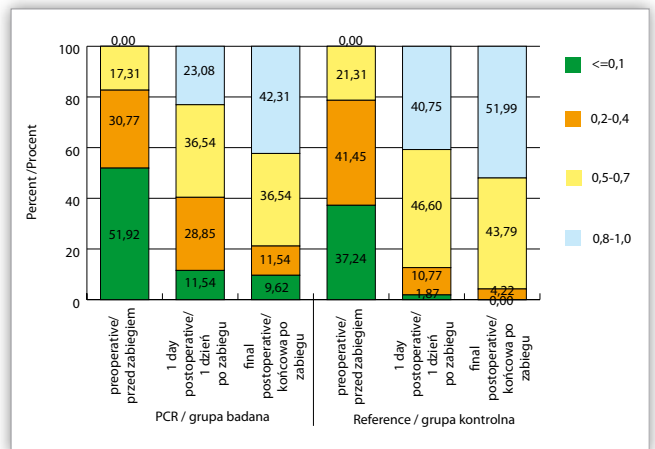


Fig. 1. Pre- and postoperative best corrected visual acuity in both groups.

Ryc. 1. Ostrość wzroku z najlepszą korekcją przed zabiegiem i po zabiegu w obu grupach.

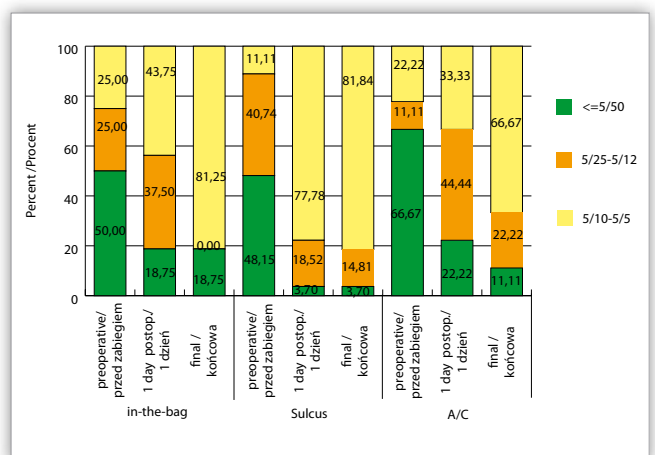


Fig. 2. Pre- and postoperative best corrected visual acuity in PCR group, depending on the IOL placement.

Ryc. 2. Ostrość wzroku z najlepszą korekcją przed zabiegiem i po zabiegu w grupie z pęknięciem torebki, w zależności od miejsca wszczepu soczewki.

N (%)	PCR group/ Grupa badana	Reference group/ Grupa porównawcza
In-the bag implantation/ wszczep dotorebkowy	16 (31%)	427 (100%)
Ciliary sulcus/ wszczep do bruzdy ciała rzęskowego	27 (52%)	0
Anterior chamber implant/ wszczep przedniokomorowy	9 (17%)	0

Tab. I. Site of IOL implantation.

Tab. I. Miejsce wszczepienia soczewki wewnątrzgłokowej.

(Mann-Whitney U test: $p < 0.001$) (Fig. 2). Within the PCR group, mean BCVA of the subgroup with anterior chamber implant was 0.61 ± 0.29 . BCVA of patients from the PCR group who received posterior chamber lens was not significantly different and amounted to 0.64 ± 0.26 (Mann-Whitney U test: $p > 0.5$).

All patients from the reference group had their IOLs implanted in-the-bag. In contrast, in-the-bag implantation constituted only 30.77% (16 eyes) of the capsular rupture group. Further 27 patients of this group (51.92%) had the IOL implanted to the ciliary sulcus. The rest of the group (9 eyes, 17.31%) received an anterior chamber lens. None of the eyes was left aphakic (Tab. I).

In the PCR group there were 10 patients (19%) requiring mechanical anterior vitrectomy, the rest did not have vitreous loss requiring this procedure. Anterior vitrectomy was not performed in any patient from the reference group. Two patients (4%) from the PCR group had an intraoperative pupillary miosis, in 4 patients (8%) the pupil margin was slightly damaged by the phaco tip, in 1 patient (2%) the surgery was complicated by a dropped nucleus and in 1 patient there was a vitreous haemorrhage.

In the reference group 1 patient (0.002%) had an intraoperative iris contraction, which however was remedied by the use of iris hooks (retractors), and did not prevent the surgeon from performing a successful procedure. There were no other intraoperative complications in this group.

Postoperatively, in the PCR group 20 patients (38.5%) had Descemet membrane folds (including 8 patients -15.4%), who additionally had transient corneal oedema, 2 patients (3.9%) had trace of dispersed blood in the anterior chamber, 2 patients (3.9%) had fibrinoid reaction in the anterior chamber. There was transient intraocular pressure rise in 1 eye (2%), cystoid macular oedema in 1 eye and retinal detachment in 1 eye.

In the reference group Descemet folds were present in 42 patients (9.8%), transient corneal oedema was found in 23 patients (5.4%), trace of dispersed blood in the anterior chamber in 4 eyes (0.9%), wound dehiscence in 1 eye (0.2%), fibrinoid reaction in the anterior chamber in 2 eyes (0.5%), corneal epithelium abrasion in 1 eye (0.2%), transient intraocular pressure rise in 2 eyes (0.5%). There were no cases of endophthalmitis in any group.

In total, some form of early postoperative complications were present in 51.9% of eyes from the PCR group (27 eyes) and in 18.5% of eyes from the reference group (79 eyes).

Discussion

Minimised manipulations, use of viscoelastic devices, and gentle hydrodissection may help to avoid capsular rupture. It is

thought that posterior capsule may be weaker in posterior polar cataracts, myopic eyes and eyes with pseudoexfoliation syndrome (4). In such patients posterior capsular rupture may result solely from hydrodissection, so it must be performed gently and carefully. In eyes with a shallow anterior chamber, placing the second instrument behind the nucleus may help prevent the phaco tip from contacting the posterior capsule. In eyes with a capsular tear, the surgeon may either try to perform phacoemulsification with extreme care or convert to an extracapsular technique. In such cases ultrasound of low-energy, low aspiration and low irrigation may be significant factors reducing the risk of nuclear loss, collapse of the anterior chamber and vitreous prolapse (1).

To date, there have been a few studies evaluating visual outcome in cases with posterior capsule rupture, describing various results. In our data, we found a similar incidence of PCR (5.2%), than in previously published studies (4-18%) (2,5). In our group we found that in the vast majority of eyes (87%) from the PCR group postoperative BCVA was better than preoperatively, despite the fact that intraoperative and early postoperative complications occurred. In the literature, some authors have found a generally good visual outcome after PCR, with a similar rate of postoperative improvement in BCVA (5,6,7), however some others found PCR to be a significant risk factor of decreased final visual acuity (8).

The observed slight difference in preoperative BCVA between the groups (with a worse preoperative mean BCVA in the PCR group), most probably reflects more advanced cataract in the PCR group, which suggests that more advanced cataract may be a risk factor of PCR.

We observed that ciliary sulcus was the site chosen the most frequently for the IOL implantation in eyes with PCR. In very large complicated capsular tears when neither in-the-bag, nor sulcus placement of the IOL is safe, it is possible either to leave the eye aphakic (for secondary IOL implantation in the future), to implant the lens to the anterior chamber or to use a sclerally fixated posterior chamber lens. In our data, we found 1 patient from Group I with a dropped nucleus, who was subsequently successfully treated with pars plana vitrectomy, phacoemulsification of luxated lens in the vitreous cavity and implantation of the sclerally fixated IOL (1).

We also found that in our study vitreous loss requiring anterior vitrectomy was present in nearly one fifth of the PCR group, however, according to some other studies this percentage may be as high as 58% (5).

We found that eyes with PCR are about 2.6 times more likely to develop other intraoperative complications and early postoperative complications in comparison with controls. It is worth noting that in our study eyes with posterior capsular rupture were about 5 times more likely to have a final best corrected visual acuity worse than 0.5 than eyes from uncomplicated surgery group (21% vs. 4%). Nevertheless, our observations confirm that it is possible to achieve good final best corrected visual acuity in the majority of eyes with PCR (79% of eyes with PCR had final BCVA 0.5 or better). This is consistent with data from other studies claiming percentage of BCVA better than 0.5 equal to 84.5% (5).

Moreover, we recognise that our observations of patients were cut-off at discharge from hospital service to primary care

ophthalmologists, therefore we do not have data regarding late postoperative complications.

Eyes with intraoperative posterior capsule rupture during phacoemulsification have a higher risk of reduced visual acuity, however, in cases where posterior capsule rupture occurs it is possible to achieve good final best corrected visual acuity in the majority of eyes with PCR. Appropriate intraoperative and postoperative management will usually allow to perform a successful procedure with safe placement of an intraocular lens, thus ensuring a relatively favourable outcome.

Although in our department scleral tunnel incisions were replaced by small clear corneal incisions (including MICS technique), with foldable IOLs implantation, we believe that this study is valuable as a retrospective analysis of results and complications in cases of posterior capsular rupture.

This study was presented at the XXIV Congress of the European Society of Cataract and Refractive Surgeons, held on the 07-13.09.2006 in London, UK.

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