Effect of Cataract Surgery with Phacoemulsification on Diabetic Retinopathy

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✔ To asses the influence of cataract surgery and posterior chamber intraocular lens implantation on retinopathy progression, and visual acuity in patients with different stages of diabetic retinopathy (DR).

Ninety-three eyes of 76 patients with or without diabetic retinopathy were evaluated prospectively following cataract extraction with posterior chamber intraocular lens implantation between January 1995 and December 2000. The ocular findings were recorded on each follow-up visits for at least 3 months.

Seventeen eyes (26.9%) showed progression of retinopathy in the follow-up period in eyes with retinopathy. Two eyes (6.6%) preoperatively without retinopathy developed background diabetic retinopathy. Worsening of retinopathy in eyes with diabetic retinopathy was higher than eyes with no-diabetic retinopathy ($p<0.05$). Good visual acuity of 5/10 or better was achieved in 3 eyes (18.7%) with proliferative DR, in 21 eyes (44.6%) with non-proliferative DR and 29 eyes (96.6%) with no-DR.

The results of this prospective study indicate that diabetic retinopathy may worsen after cataract surgery.

Key words: *cataract, phacoemulsification, diabetic retinopathy*

✔ **Fakoemülsifikasyon Yöntemi ile Yapılan Katarakt Cerrahisinin Diabetik Retinopatiye Olan Etkisi**

Bu çalışmada fakoemulsifikasyon yöntemi ile katarakt cerrahisi yapılıp arka kamara intraoküler lens (AKİOL) konulan hastalarda diabetik retinopati (DR) seyrinin ve görme keskinliğinin değerlendirilmesi amaçlandı.

Ocak 1995-Kasım-200 yılları arasında katarakt cerrahisi yapılıp AKİOL konulan 76 hastanın 93 gözü prospektif olarak değerlendirildi. En az 3 ay takibi olan hastalar çalışma kapsamına alınıp bulgular kaydedildi.

Diabetik retinopatili gözlerin 17'sinde (%26.9) retinopatide progresyon görüldü. Cerrahi öncesi retinopati olmayan gözlerden 2'sinde başlangıç dönem diabetik retinopati bulguları gelişti. Diabetik retinopati progresyonu retinopatili gözlerde retinopatisi olmayan gözlere göre daha yüksek oranda saptandı ($p<0.05$). 0.5 ve üzeri görme proliferatif DR'li 3 gözde (%18.7), Non proliferatif DR'li 21 gözde (%44.6), DR olmayan 29 gözde (%96.6) tespit edildi.

Bu çalışma katarakt cerrahisinin diabetik retinopatiyi kötüleştirdiğini göstermektedir.

Anahtar kelimeler: *katarakt, fakoemulsifikasyon, diabetik retinopati*

INTRODUCTION

Diabetes mellitus is a common condition, affecting 1-2% of the population. Cataract occurs earlier in diabetics than in non-diabetics, and both cataract and retinopathy are related to the age of the patient and the duration of the diabetes. Cataract surgery in diabetics may be performed to improve vision or to allow assessment and treatment of retinopathy[1,2]. Cataract surgery in diabetics with little or no retinopathy has the same good prognosis as cataract surgery in non-diabetics. However, in the presence of significant diabetic retinopathy the results can be disappointing[3]. Studies have reported that the risk factors for the postoperative progression of diabetic retinopathyare these such as young age, background retinopathy, active proliferative retinopathy, insulin therapy, and poor control of

blood glucose. Severe visual loss following cataract surgery in diabetics may be due to worsening macular edema, continuing anterior and posterior segment proliferation, posterior capsule opacification level[4,5]. Adequate panretinal laser photocoagulation is therefore essential if there is severe peripheral retinal ischaemia or early retinal neovascularisation[3].Preoperative and early postoperative photocoagulation for macular edema appears to reduce but not to eliminate. Evidence suggests that diabetic retinopathy may worsen after cataract surgery and that the visual prognosis after cataract surgery is poor in patients with diabetes.

Phacoemulsification with posterior chamber intraocular lens (PC-IOL) implantation is currently the most widely used technique for managing diabetic cataract. In this study, we evaluated postoperative findings in the anterior segment and progression of diabetic retinopathy following phacoemulsification with PC-IOL implantation in diabetic patients.

MATERIALS AND METHODS

This study included 93 eyes of 76 patients, with or without diabetic retinopathy who underwent cataract extraction with posterior chamber intraocular lens implantation in our department between January 1995 and December 2000. A full medical and ocular history was taken for each patient. We noted the number of years diabetes had been present, the type of diabetic control and medication used. A complete ocular examination was performed at each follow-up visit, including visual acuity, intraocular pressure, slit-lamp examination, Goldman three-mirror examination and fundus flourescein angiography (FFA). Surgery was carried out in both eyes in 17 patients and monocularly in 59 patients. The preoperative classification of diabetic retinopathy is shown in Table I.

Seven patients were on insulin treatment, 56 patients with oral antihyperglycaemic agents and 13 patients were treated with diet alone. All patients had non-insulin dependent diabetes mellitus.

Table I. Preoperative Stage of Diabetic Retinopathy.

Retinopathy types	Eyes	
	Number	%
No retinopathy	30	32.2
Background retinopathy	43	46.3
Preproliferative retinopathy	4	4.3
Proliferative retinopathy	16	17.2

Phacoemulsification technique consisting a corneal tunnel incision, a large continuous circular capsulorhexis, and in-the-bag implantation of a single-piece polymethyl methacrilate (33 eyes) and a foldable IOL (60 eyes). The corneal cut was closed sutureless or with single suture. Patients who had posterior capsule rupture during surgery were not accepted into the study.

All patients were followed up for 3 months at least, and ocular findings were recorded at postoperative third and fifth days, second week, first, third, sixth and twelfth month and annually. Patients with decreased visual acuity were evaluated for other pathologies other than diabetic retinopathy.

On the basis of the diabetic retinal findings, two groups were identified; no change group and progression group. Progression was considered to have occurred when: after surgery an eye with pre-existing non-proliferative diabetic retinopathy (NPDR) showed postoperative aggregation of the non-proliferative changes with or without the occurrence or aggravation of cystoid macular oedema (CMO) or showed development of proliferative diabetic retinopathy (PDR), an eye with PDR showed postoperative recurrence of proliferative changes or development of non-proliferative changes in the posterior pole, with or without the occurrence or aggravation of CMO. The postoperative occurrence of CMO alone without other evidence of aggravation of diabetic retinopathy was not regarded as progression of retinopathy since CMO is a known complication after cataract surgery even in the absence of diabetic retinopathy. Cystoid macular oedema was

evaluated using (+) 90 D lenses, Goldman three-mirror examination and FFA.

Statistical analysis were carried out using chi square method.

RESULTS

Of the 76 patients 44 were women and 32 were men. The mean age at the time of surgery was 63.7 years (range 38 to 87 years) and the mean duration of diabetes mellitus was 10.8 years (ranging from 6 months to 30 years). Cataract extraction was unilateral in 59 and bilateral in 17 patients.

All patients were followed up at least for 3 months. The range of follow up intervals of patients was 3 to 60 months (mean of 22.2 months).

As shown in Table II, progression of the retinopathy in diabetic eyes occurred in 19 eyes (20.4%) in the follow-up period. Two eyes (6.6%) without retinopathy preoperatively developed background retinopathy. Worsening of retinopathy in eyes with DR was higher than eyes with no-DR ($p<0.05$, $X^2=3.99$, OR=5.17). Progression of retinopathy in monocularly operated 59 patients was detected in 12 eyes (20.3%). The worsening of retinopathy according to types of retinopathy in monocularly operated patients is shown in Table III.

Table II. The Progression of Retinopathy in the Postoperative Period.

Retinopathy type	Total eyes	Progression	
		n	(%)
No DR	30	2	(6.6)
Background DR	43	11	(25.6)
Preproliferative DR	4	1	(25.0)
Proliferative DR	16	5	(31.2)
Total	93	19	(20.4)

The results of retinopathy progression in 39 eyes receiving Argon laser photocoagulation (ALP) (focal or panretinal) are summarised in Table IV, and shows that retinopathy was less frequent in preoperative ALP (+) group, but the difference was not statistically significant as compared to ALP (-) group ($p>0.05$, $X^2=0.36$, OR=1.67).

Table III. Progression of Retinopathy in Monocular Operated Patients According to Non-operated Eyes.

	Total eyes	No progression		Progression	
		n	%	n	%
All patients	59	47	(79.7)	12	(20.3)
Patients with DR	41	30	(73.2)	11	(26.8)
Patients with no-DR	18	17	(94.4)	1	(5.6)

Table IV. Progression of Retinopathy According to Preoperative ALP Treatment.

	Number	Progression
ALP(+) with DR	39	9 (23.1%)
ALP(-) with DR	24	8 (33.3%)
No-DR	30	2 (6.6%)

The development of postoperative clinical cystoid macular oedema (CMO) according to diabetic retinopathy types was evaluated, and shows that CMO was detected in 19 eyes (30.1%) with diabetic retinopathy and in 3 eyes (10.0%) with no-DR in the postoperative period. This difference was statistically significant ($p<0.05$, $X^2=4.62$, OR=4.5).

As shown in Table V, visual results were poorest in diabetic maculopathy or proliferative retinopathy than no-DR group. Good visual acuity of 0.5 or better was achieved in 3 eyes

Table V. Visual Results in Postoperative Period.

		Visual acuity					
		0.1↓		0.1-0.4		0.5 or↑	
	n	n	(%)	n	(%)	n	(%)
No-DR	30	1*	3.2	–	–	29	96.6
Non-PDR	47	8	17.0	18	38.3	21	44.7
PDR	16	10	62.6	3	18.7	3	18.7
Total	**93**	**19**	**20.4**	**21**	**22.6**	**53**	**57.0**

*Depending on age-related macular degeneration

(18.7%) with PDR, in 21 eyes (44.6%) with non-PDR and 29 eyes (96.6%) with no-DR. Causes of low visual results in patients with diabetic retinopathy were: diabetic maculopathy, fibrovascular changes in posterior pole, optic atrophy, vitreous haemorrhage, tractional retinal detachment.

The types of operative and postoperative complications recorded in a few number of diabetic eyes are summarised in Table VI.

Table VI. Postoperative Complications in Diabetic Eyes.

Complications	n	%
Corneal oedema	5	5.4
Postoperative intraocular pressure rises	5	5.4
Fibrinous membrane and posterior synechiae	3	3.2
Posterior capsule opacification	15	16.1
Macular oedema	24	25.8

DISCUSSION

Our findings indicate that diabetic retinopathy progresses frequently in patients who underwent cataract extraction and posterior chamber IOL implantation. Studies carried out previously suggested that the removal of the lens contributes to worsening of diabetic retinopathy[5,6]. Many patients including those with diabetic retinopathy may have very high expectations from cataract surgery. For this reason, patients with diabetic retinopathy and cataract need to be advised preoperatively that retinopathy and vision may worsen after cataract extraction. In most cases, retinopathy progression was characterised by worsening of non-proliferative retinopathy. Risk factors associated with worsening retinopathy after cataract surgery include pre-existing severely treated or untreated retinopathy, poor glysemic control, increasing age, and posterior capsule disruption[7]. Whatever the aetiology, the retinal capillaries appear to react with a pathological response to the surgery, resulting in disruption of the blood-retinal barrier and/or occlusion of the capillaries. The clinical correlates of these events are transudation and macular oedema and/or induction of retinal ischemia leading to neovascularization[8]. In previous studies, the progression of retinopathy occurred at the rate of 42% in 70 eyes[9], 13% in 91 eyes[10], 21% in 47 eyes[11], and 20.4% in 93 eyes this study. We applied monocular surgery in 59 eyes with similar retinopathy stage, and worsening of diabetic retinopathy occurred in 12 eyes (20.3%) compared to non-operated eye. We found that this progression was more evident particularly in patients with pre-existing diabetic retinopathy (26.8% of eyes with DR compared to 5.6% eyes of with no-DR) with a statistically significant rate of occurrence ($p<0.05$).

The results of this study suggest that preoperative laser treatment attenuates the postoperative retinopathy course since progression of retinopathy occurred in 23.1% ALP (+) and 33.3% ALP(-) eyes of diabetic retinopathy. Adequate panretinal laser photocoagulation is essential if there is severe peripheral retinal ischemia or early retinal neovascularization. This photocoagulation should be applied preoperatively. If this not possible it can be done in the early postoperative period[3]. Pollack et al.[2] reported that preoperative laser treatment may stabilise the retinopathy but does not prevent all postoperative progression. Therefore, all patients should be followed up carefully in the early postoperative period, so that if progression or significant macular oedema develops it can be treated at the earliest possible time[12].

The incidence of CMO after cataract surgery is higher 4-12 weeks after surgery, although it may occur even years later and frequently in diabetic patients than non-diabetic subjects[13,14]. Pollack et al.[15] reported that CMO was observed in 50% of eyes with diabetic retinopathy in 6 weeks after surgery. In this study, CMO occurred in 10.0% of eyes without pre-existing diabetic retinopathy and in 33.3% of eyes with pre-existing diabetic retinopathy, and its occurrence was less in eyes of applied ALP in preoperative period.

Flanagan16 pointed out that cataract surgery in diabetics with little or no retinopathy has the same good prognosis as cataract surgery in non-diabetics. Eyes with minimal background retinopathy or no retinopathy have an excellent prognosis after cataract surgery with intraocular lens implantation[17,18]. However, in the presence of significant diabetic retinopathy the results can be disappointing[19]. The results of our present study confirmed that the patients with preexisting diabetic retinopathy have a worse visual prognosis than those without retinopathy. In our series 0.5 or better visual acuity (Snellen lines) was achieved in 96.8% of eyes with no-DR, 44.0% of eyes with non-proliferative DR and 16.7% of eyes with proliferative DR. Final visual acuity improved in 74 eyes (79.6%) while 19 eyes (20.4%) had no improvement. Raskauskas et al.[19] reported that visual acuity improved by two Snellen lines or more in 40% with eyes in DR and worsened in 25% of eyes with DR.

Some studies emphasise that the incidence of postoperative anterior segment complications are significantly higher in the diabetic than in the non-diabetic patients[20,21]. However, we have observed few operative and postoperative complications which included macular oedema (25.8%), posterior capsule opacification (16.1%), postoperative intraocular pressure increase (5.4%), corneal oedema (5.4%), fibrinous membrane and posterior synechiae (3.2%). Rubeosis iridis and neovascular glaucoma was not developed. We think that more attentive preparation of patients to surgery may decrease operative and postoperative complications.

CONCLUSIONS

The results of this prospective study indicate that diabetic retinopathy may worsen after cataract surgery and that preoperative argon laser treatment may decrease progression of diabetic retinopathy without complete elimination. Furthermore the incidence of CMO is higher in diabetic patients, and cataract surgery in diabetics with little or no retinopathy has the same good prognosis as cataract surgery in non-diabetics.

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