The Effects of Phacoemulsification and Implanted Silicon Intraocular Lens on Intraocular Pressure*

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✔ Ophthalmic surgeons have commonly used phacoemulsification since it has the advantages of small incision and foldable lens usage. In this study, we investigated the effects of Phacoemulsification (phaco) and foldable intraocular lens (IOL) on intraocular pressure. Between January 1995 and September 1996, 124 eyes of 114 patients which have been performed Phaco and implanted foldable silicon IOL were examined, retrospectively. The mean age of the patients were 57.78±15.2 year (range 15 to 58 year), 46 (40.4%) of them were female, and 68 (59.6%) were male. The mean postoperative follow-up is 4.81±1.8 months (range 15 day to 15 month). The mean value of preoperative second day. A significant increase in intraocular pressure was found ($p<0.05$). Fourteen patients had postsurgical intraocular pressure exceeding 23 mmHg, and antiglaucomatous medication was used. In nine of the 14 patients, the antiglaucomatous medication could be discontinued within one month and in the remaining 5 patients medication had to be continued.

Increased intraocular pressure in the immediate postoperative period commonly occurs after phacoemulsification and can easily be controlled with antiglaucomatous medication.

Key words: *Cataract surgery, phacoemulsification, intraocular pressure, foldable silicon lens*

✔ **Fakoemülsifikasyon ve Silikon Göziçi Mercek Uygulamasının Göziçi Basıncına Etkisi**

Göz doktorları, küçük kesi ile birlikte katlanabilir lens kullanımının avantajlı olması nedeniyle, katarakt cerrahisinde genellikle fakoemülsifikasyon (fako) yöntemini kullanmaktadır. Bu çalışmada fakoemülsifikasyon yöntemiyle birlikte katlanabilir silikon göziçi mercek(GİM) kullanılan olgularda göziçi basınç değişikliğini araştırdık. Bu amaçla Ocak 1995 veEylül 1996 tarihleri arasında Fako ve katlanabilir GİM uygulanan 114 hastanın 124 göz sonuçları retrospektif olarak incelendi. Hastaların 46'sı kadın (%40.4), 68'i erkek (%59.6) olup yaş ortalamaları 57.78±15.2 (minimum 15, maksimum 58) idi. Postoperatif takip süresi 4.18±1.81 ay (min. 0.5 ay, mak. 15 ay) idi. Preoperatif göziçi basıncı (GİB) 13.40±0.25 mmHg, postoperatif 2. gün 15.01±0.51 mmHg olarak tesbit edildi. Postoperatif basınç değişikliği istatiksel olarak anlamlı bulundu ($p<0.05$). Postoperatif GİB yüksekliği (23 mmHg'nın üstü) 14 hastada saptandı ve antiglokomatöz ilaç başlanıldı. Bu olguların 9'unda başlanan antiglokomatöz tedavi bir ay içinde kesildi, 5'inde devam edildi.

Fakoemülsifikasyon sonrası GİB yükselmesi erken dönemde sıklıkla oluşmakla birlikte, antiglokomatöz tedavi ile kolaylıkla kontrol altına alınabilmektedir.

Anahtar kelimeler: *Katarakt cerrahisi, fakoemülsifikasyon, göziçi basıncı, katlanabilir silikon mercek*

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INTRODUCTION

Phacoemulsification (PE) was described by Dr. Charles Kelman in 1967[1]. In PE after entring the anterior chamber with a small (3 mm) incision, lens material is destructed by ultrasound energy and is taken out of the eye by automatic irrigation and aspiration method in a closed system[2].

After description of foldable intraocular lenses (IOL) in 1984 by Mozocco[3] and development of capsulorhexis by Gimbel and Neuhan[4], PE has been used widespreadly[5]. Ophthalmic surgeons have commonly used this technique since it has the advantages of small incision and foldable lense usage. It was reported that implantation of posterior chamber IOL after extracapsular cataract extraction (ECCE) and PE affected intraocular pressure (IOP)[6-8].

In the present study, we investigated the effects of implantation of foldable (in the bag) IOLs with PE, on IOP.

MATERIALS AND METHODS

We studied 124 eyes of 114 patients who had "in the bag" foldable IOL implantation with PE in our clinic between January 1995 and May 1996. Patients were asked for previous history of glaucoma, uveitis, intraocular surgery, retinal detachment, and diabetes mellitus. We excluded patients with preexisting glaucoma or those taking topical or systemic beta-blockers, corticosteroids, epinephrine or carbonic anhydrase inhibitors. We recorded age, sex, IOP (by Goldman applanation tonometer), slit lamp biomicroscopic findings of anterior segment, ophthalmoscopic fundus findings and visual acuity in preoperative examination. Ten patients were operated on under local anaesthesia and 104 patients under general anaesthesia. 1% Cyclopentolate hydrochloride, 10% phenylephrine hydrochloride and fluorbiprophen sodium were used four times with 30 minutes intervals for pupillary dilatation prior to operation. Azetazolamide 500 mg, 12 hours and 2 hours prior to operation, was used orally to decrease the IOP. Scleral tunnel incision was used in 68 eyes and clear corneal incision, in 56 eyes. A superior peritomy of 6-8 mm was made to expose limbus for corneoscleral incision. A 3.5 mm half depth incision 2 mm posterior to limbus was made, scleral tunnel was prepared with circular knife (Sharpoint 78-6600) and entrance to anterior chamber was made with a 3.2 mm keratome (Sharpoint 72-3261). In clear corneal incision, a half depth 3.5 mm incision to corneal limbus was made with a diamond knife. Following procedures were the same as in scleral tunnel incision with the exception of corneal tunnel. At 10.30 and 1.30 o'clock positions, two incisions were prepared for entrance of second hand enstrument. Sodium hyaluronate (Healon) was given into anterior chamber. Continuous curvilineer capsulorhexis was made with irrigating cystotome. Balanced saline solution was used for hydrodissection. After PE, the residual lens material was removed by irrigation-aspiration method using symcoe cannula. The mean ultrasound time was 2.3 minutes (range 2 to 5 minutes). Foldable plate haptic silicone IOL (STAAR,AA4203) was implanted in the bag, after viscoelastic material injection into capsular flap. Viscoelastif material was aspirated after IOL implantation. Acetylcholine was used for pupillary miosis. In 37 cases, the wound was closed with single 10.0 monoflament nylon. Subconunctival injections of betamethasone sodium phosphade 3 mg, betamethasone acetate 3 mg and gentamicin 20 mg were given and hydrocortisone acetate ointment was applied between the lids before patching te eye postoperatively.

Biomicroscopic and ophthalmoscopic examination and, IOP and visual acuity measurements were made at second, 5th and 15th days and first, third, sixth and 12th months postoperatively. According to examination findings, cycloplegic, steroid or antibiotic eye drops were prescribed. The patients having IOP higher than 23 mmHg in the first 6 hours postoperatively were given timolol maleate or betaxolol eye drops and acetazolamide orally if necessary.

Paired test was used for statistical analysis.

RESULTS

In this study 46 female and 68 male whose mean age was 57.78 (range 15 to 83 years) were explored in terms of preoperitave IOP and visual acuity. It was found that the mean preoperative IOP was 13.40±0.25 mmHg (with applanation tonometer). The visual acuity was detected better than 2/10 in 28 cases and 2/10 or worse in 96 cases (Table I). Ten patients had background diabetic retinopathy; 9, age related macular degeneration; 7, pseudoexpholiative syndrome; and 5, hypertensive retinopathy (Table II). The mean follow-up period was 4.81 months (range 0.5 to 15 months). The mean IOP was 15.01±0.51 mmHg in second day; 12.31±0.24 mmHg at the first month and 12.63±0.36 mmHg at the third month postoperatively. The postoperative second day IOPs were higher than preoperative levels ($p<0.05$). There is no statistical difference between postoperative first and third month IOPs and preoperative IOPs ($p>0.05$). Postoperative second day IOPs were significantly higher the third month IOPs ($p<0.05$).

Fourteen patients of all patients were observed postsurgical intraocular pressure exceeding 23 mmHg, and antiglaucomatous medication was used. Antiglaucomatous medication was given up in 9 patients whom IOPs were within normal levels. The other 5 patients required topical medication for IOP control two of these 5 patients had recurrent uveitis due to Behçet's disease and their IOPs were about 20 mmHg, in their follow up. There was no need for surgical procedures

Tablo I. Preoperative Characteristic of the Patients

Characteristic	number
Mean intraocular pressure	13.40±0.25 mmHg
Sex	
Female	46
Male	68
Mean age	57.78±15.2 (range 15 to 83 years)
Total case number	114
Total eye number	124
Visual acity	
2/10 - 6/10	28
<2/10	96
Total	**45 (36.25)**

Tablo II. Preoperative Ocular Diseases Other Than Cataract

Disease	Number (n=124) %
Background diabetic retinopathy	10 (8.06%)
Pterygeum	8 (6.45%)
Age related macular degeneration	9 (7.25%)
Pseudoexpholiative syndrome	7 (5.64%)
Hypertensive retinopathy	5 (4.03%)
Chorioretinal scar	3 (2.41%)
Behçet's disease	3 (2.41%)
Total	**45 (36.25)**

laser trabeculoplasty, laser iridotomy or trabeculectomy) to control IOP.

Posterior capsular opacification was seen in 5 patients and 3 of them had Nd: YAG laser capsulotomy. One patient had retinal detachment and 6 patients had IOL dislocation (Table III). While visual acuity was improved in 119 eyes (95.66%) and decreased in 3 eyes (2.41%), no change was observed in 2 eyes (2.41%) (Table IV).

Tablo III. Postoperative Complications

Complication	Number (n=124) %
Early increase in intraocular pressure	14 (11.3%)
Opacification of posterior capsule	5 (4.03%)
Intraocular lens dislocation	6 (4.83%)
Posterior synechia	2 (1.61%)
Retinal detachment	1 (0.80%)
Corneal decompansation	1 (0.80%)
Total	**29 (23.37%)**

Tablo IV. Final Visual Acuity Postoperatively

Visual acuity						
> 0.7	0.4 - 0.6	0.1 - 0.3	< 0.1	Increased	Unchanged	Decreased
84 (67.74%)	18 (15.32%)	14 (11.29%)	7 (5.64%)	119 (95.96%)	2 (1.61%)	3 (2.4%)

DISCUSSION

The zonulocapsular diaphragm remains intact in cataract surgery with PE and ECCE and prevents passage of vitreus into anterior chamber. It limits IOP increase after cataract surgery[9]. Free vitreus in anterior chamber may occlude trabecular meshwork and may cause glaucoma due to pupillary or ciliary blockage. The intact capsular diaphragm is a desired condition in patient having trabeculectomy. Other reasons of IOP increase after ECCE are trabecular meshwork injury[10], prostoglandin synthesis[11], peripheric anterior synechia, inflammatory breakdown, viscoelastic material usage[12] and hyphema. Also, Bomer et al. reported that, the intraocular pressure rise after phacoemulsification and posterior lens implantation depends strongly on the technique of wound closure and the surgeon's experience[13]. The majority of our cases were operated by the same surgeon. All patients were implanted in the bag foldable silicone IOL, and sodium hyaluronate was used in all eyes. The cases where foldable IOL could not be implanted, were excluded.

Posterior chamber IOL implantation (in the bag or sulcus fixated) provides physiological replacement to lens and maintains opening of iridocorneal structures by stretching zonules and prevents collapse of schlemm channel by stretching ciliary body, and chronic irritation of IOL may decrease secretion of aquous humor[9,14,15]. The reduced IOP also may be associated with a hyposecretion of aqueous resulting from traction on the ciliary body due to fibrosis and contraction of the posterior lens capsule[16]. The another reason cited for this drop in pressure is the decreased resistance to aqueous humor outflow due to increased anterior chamber depth[17] or higher level of prostaglandin (F2) in the aqueous humor[18].

The mean preoperative IOP was 13.40±0.25 mmHg and postoperative second day mean IOP was 15.01±0.51 mmHg; first

month, 12.31±0.24 mmHg; and third month, 12.63±0.36 mmHg. Postoperative second day IOPs were significantly higher than preoperative levels ($p<0.05$). Fourteen patients had been given acetalozamide postoperatively due to their postoperative 6th hour findings and therefore, their IOPs on the second postoperative day were lower and postoperative IOP increase may have been underestimated. Antiglaucomatous medication of nine patients were given up within one month and other 5 patients went on timolol maleat 0.5% or betaxolol hydrochloride topically. Two of these with IOPs about 20 mmHg had recurrent uveitis due to Behçet's disease. Third month IOPs were significantly lower than second day IOPs postoperatively ($p<0.05$). Since 64% of patients did not complete sixth month controls, the sixth month IOPs were not analysed. Holmberg&Philipson reported IOP increase in 4 of 28 cases (10.5%)[19]. One patient with acute glaucoma crisis was reported in 135 cases[20]. Some authors[21] determined IOP increase and others reported no IOP increase but decrease after second month[6]. The IOP increase after ECCE was reported between 11% to 55%[12,22,23]. Zetterström et al.[8] reported significant increase in IOP on the first day after PE, on the other hand it is reported that there was a significant IOP decrease in the late stages (6 months)[24].

The pressure increased from baseline to the maximum 5-7 hours after surgery. Whitefield et al. reported that, transient intraocular pressure rises of 30 mmHg or greater were seen in there of 100 eyes and all had normal intraocular pressures at examination 24 hours later[25]. In some studies related to IOP changes after PE, IOPs were increased in early stages and decreased or unchanged in later stages[8,19,20]; and in others, IOPs did not changed in early stages and decreased later[6,24]. Also, Kooner et al. reported that, secondary glaucoma after one year in 3.3% of 242 eyes following phacoemulsification[17]. In our study, there was significant IOP increase on the second postoperative day ($p<0.05$) and although it wasn't significant there was a decrease on the first and the second months ($p>0.05$).

This intraocular pressure increase is important because some eyes may be susceptible to moderate transient increases in intraocular pressure (for example, eyes with advanced glaucoma or anterior ischemic optic neuropathy)[26,27]. The increase in early stages was controlled with medical treatment without surgical requirement.

In conclusion, after PE, IOP may increase in early stages and it becomes lower in late stages. This IOP decrease suggests that PE can be used safely in primary open angle glaucoma patients whose IOPs are in borderline levels; but it should be supported by studies made on POAG patients.

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