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Vitreoretinal surgery for retained lens fragments after phacoemulsification

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PURPOSE. *To evaluate the prognostic factors, effect of timing and outcomes of vitreoretinal surgery for removal of retained lens fragments after phacoemulsification.*

METHODS. *A retrospective review of 43 eyes of 43 patients who had vitreoretinal surgery for retained lens fragments after phacoemulsification, between January 1998 and November 2000.*

RESULTS. *Seven of the 43 patients underwent vitrectomy on the same day as cataract surgery, 20 in the first week, and 23 after the first week, with a mean of 14.8 days (0-90). Initial visual acuity was ≤ 20/400 in 27 (75%, n=36) and intraocular pressure (IOP) ≥ 25 mmHg in 22 (61%, n=36) eyes with or without medication. The mean preoperative IOP was 27.4 mmHg. Initial ocular findings included moderate or severe corneal edema in 17 patients (40%), uveitis in 14 (33%), retinal detachment in 1 (2%) and vitreous hemorrhage in 2 (5%). After a mean follow-up of 8.4 months, final best-corrected visual acuity (BCVA) was ≥ 20/40 in 24 patients (56%) and ≤ 20/400 in 7 (16%). Persistent corneal edema (one eye), cystoid macular edema (four eyes), age-related macular degeneration (one eye) and suprachoroidal hemorrhage (one eye) were the causes of BCVA ≤ 20/400. Final mean IOP was 15.2 mmHg and only one case had IOP > 25 mmHg. Uveitis disappeared in all cases (p<0.001), and corneal edema persisted in only one eye. Both the BCVA and IOP differences were significant (p<0.001), but no correlation was found between pre- and postoperative BCVA and IOP as regards vitreoretinal surgery timing, posterior or anterior removal sites and IOL implantation sites or procedures.*

CONCLUSIONS. *Vitreoretinal surgery is effective for removing retained lens fragments after phacoemulsification, lowering the IOP and reducing the uveitic reaction and corneal edema. BCVA ≥ 20/40 can be reached in at least half the patients. (Eur J Ophthalmol 2003; 13: 69-73)*

KEY WORDS. *Phacoemulsification, Retained (dislocated) lens fragments (material), Vitreoretinal surgery*

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INTRODUCTION

The increasing number of phacoemulsification procedures has led to an increase in the numbers of cases with dislocation of lens fragments and related complications. The rate of dropped nuclei or retained lens fragments (RLF) after phaco procedures is reportedly between 0.04% and 4% (1-4).

Lens material has antigenic properties (5, 6), and the inflammatory response generally starts from 24 hours to 14 days after the surgery or injury to the lens. Severe vitreitis can occur if lens material remains in

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the vitreous cavity. In cases with an inflammatory response to lens material, cytologic studies show foamy macrophages with lens material and neutrophils surrounding intact lens material (7). The lens nucleus without significant cortical material can also stimulate an inflammatory response. Wolter (8) found large epithelioid and giant cells around the surface of the lens nucleus two years after dislocation. This explains persistent inflammatory reactions in eyes even with only nuclear particles.

Corneal edema may be present as early as the first postoperative day. Cortical lens fragments may plug the trabecular meshwork, raising intraocular pressure (IOP). Peripheral retinal detachment or choroidal detachment can also occur as a result of attempts to extract posterior lens fragments by irrigation or mechanical invasion of the posterior vitreous (9).

This study assessed the prognostic factors, effect of timing and outcomes of vitreoretinal surgery for removal of RLF after phacoemulsification.

PATIENTS AND METHODS

We made a retrospective review of 43 eyes of 43 consecutive patients who had had vitreoretinal surgery for RLF after phacoemulsification, between January 1998 and November 2000 in SSK Istanbul Hospital Ophthalmology Department. Best corrected visual acuity (BCVA), non-contact tonometry readings, slit-lamp biomicroscopy and funduscopy were obtained pre- and postoperatively. Corneal edema was defined as corneal thickness more than 1.5 times normal (Sonomed Pachymetry) and significant intraocular inflammation as > 2+ cells and flare. All the statistical calculations were done using SPSS for Windows (chi-square linear test of trend and the exact linear by linear association tests).

Of the 43 patients 22 were female (51%) and 21 male (49%). Table I shows their main characteristics. Mean age was 64.8 years. The mean phaco-PPV (pars plana vitrectomy) interval was 14.8 days. In the first group 20 cases underwent PPV within the first week (7 on the same day) and in the second group 23 cases after the first week. Mean follow-up was 8.4 months.

The initial ocular findings are summarized in Table II. Mean preoperative IOP was 27.4 mmHg. Initial ocular findings included moderate or severe corneal edema in 17 patients, uveitis in 14, vitreous hemorrhage in 2 and retinal detachment in 1.

Surgical techniques

Once the cataract incision was stable, all eyes underwent standard 3-port PPV with DORC Harmony vitrectomy. Table III summarizes the surgical techniques and procedures.

Table IV shows the IOL positions before and after PPV. Before PPV, 18 cases already had PC-IOLs, 11 AC-IOLs and 14 were aphakic. In addition to PPVs at the same session, IOLs were implanted in the posterior chamber of 24 eyes (56%), in the anterior chamber of 14 (33%) and by scleral fixation in 3 (7%); only 2 eyes (4%) were left aphakic.

TABLE I - CASE CHARACTERISTICS

Case characteristics	Mean	Range
Age (years)	64.8 ± 6.7	46 - 79
Phaco-PPV interval (days)	14.8 ± 16.7	0 - 90
PPV ≤ 7 days (n=20)	3.5 ± 3.3	0 - 7
PPV > 7 days (n=23)	24.6 ± 17.5	8 - 90
Follow-up (months)	8.4 ± 5.2	2 - 27

PPV= Pars-plana vitrectomy

TABLE II - INITIAL OCULAR FINDINGS

Initial ocular findings	n	(%)
BCVA ≤ 20/400	27	(75)
IOP ≥ 25 mmHg*	22	(61)
Corneal edema	17	(40)
Inflammation	14	(33)
Vitreous hemorrhage	2	(5)
Retinal detachment	1	(2)

* With or without medication

RESULTS

Table V shows the findings before and after PPV for RLF and statistical significance and BCVA before and after PPV is shown in Table VI. After a mean follow-up of 8.4 months, final best-corrected visual acuity (BCVA) of ≥ 20/40 was achieved in 24 (56%) of patients and BCVA of ≤ 20/400 remained in 7 (16%). A significant increase of BCVA ($p<0.001$) and significant decreases of IOP, inflammation and corneal edema were achieved after PPV ($p<0.001$). Persistent corneal edema (one eye), cystoid macular edema (four eyes), age-related macular degeneration (ARMD) (one eye) and suprachoroidal hemorrhage (one eye) were the causes of poor vision (BCVA ≤ 20/400). Suprachoroidal hemorrhage unfortunately occurred in one case, after injecting viscoelastic solution just before the implantation of a foldable IOL. This patient underwent a successful vitrectomy two months later in another center and had visual acuity of 0.2. One patient from the BCVA ≥ 20/40 group had retinal detachment nine months after PPV and underwent a second vitreoretinal surgery procedure; the retina was reattached, recovering the same visual acuity. Another case with a symptomatic retinal horseshoe tear was treated by argon laser.

Final mean IOP was 15.2 mmHg and only one case had an IOP over 25 mmHg. Uveitis disappeared in all

TABLE III - SURGICAL TECHNIQUES AND PROCEDURES

Surgical techniques and procedure	n	(%)
Cataract incision stability	43	(100)
Standard 3-port PPV	43	(100)
Vitrectomy for cortex and soft fragments	43	(100)
Liquid perfluorocarbons	25	(58)
Fragmatomy for harder nuclear fragments	21	(49)
Anterior removal through limbus	4	(9)
PC-IOL	24	(56)
AC-IOL	14	(33)
SC-FIX-IOL	3	(7)
Aphakia	2	(4)
Scleral buckling + endolaser	1	(2)
Air	15	(35)
C3F8	3	(7)
SF6	2	(4)

TABLE IV - IOL POSITIONS BEFORE AND AFTER PPV

	PC IOL		AC IOL		Aphakic	
	n	(%)	n	(%)	n	(%)
Before PPV	18	(42)	11	(26)	14	(33)
After PPV	27	(63)	14	(33)	2	(4)

TABLE V - FINDINGS BEFORE AND AFTER PPV FOR RLF AND STATISTICAL SIGNIFICANCE

Findings	Before PPV		After PPV		
	n=36	(%)	n=43	(%)	p
BCVA > 20/400	9	(25%)	36	(84%)	<0.001
BCVA ≤ 20/400	27	(75%)	7	(16%)	<0.001
IOP ≥ 25 mmHg*	22	(61%)	1	(2%)	<0.001
Corneal edema	17	(40%)	1	(2%)	<0.001
Inflammation	14	(33%)	-	(0%)	<0.001

* With or without medication

cases (p<0.001), persistent corneal edema remained in only one eye. Both the BCVA and IOP differences were statistically significant (p<0.001), but no correlation was found between pre- and postoperative BCVA and IOP as regards the timing of vitreoretinal surgery, posterior or anterior removal sites and IOL implantation sites or procedures.

DISCUSSION

In several papers regarding PPV for RLF reported BCVA outcomes of ≥20/40 in 44-68%, and ≤20/400 in 10-20% (10-18). We obtained similar results: 56% and 16% respectively (Tab. VII). In a recent prospective study on 22 eyes, Yeo et al found a clinicopathological correlation and stated the importance of timing in relation to visual acuity, infammation and IOPs (18). Large, multicenter, prospective serial studies may be helpful in clearing up this point.

IOP of ≥30 mmHg have been reported in 32-86% before and 3-41% after PPV for RLF (10, 12, 14, 15, 18). IOP of >25 mmHg have also been reported in 46-52% before (11, 13), and 25% after PPV (13). In our study we had IOPs of ≥ 25 mmHg in 62% of patients before, and 2% after PPV. Most of these patients were receiving medication, especially in the postoperative period. As the IOP ranges and medications are dif-

TABLE VI - BCVA BEFORE AND AFTER PPV

BCVA	Before PPV		After PPV	
	n:36	(%)	n:43	(%)
≥ 20/40	2	(6)	24	(56)
20/40-20/400	7	(19)	12	(28)
≤ 20/400	27	(75)	7	(16)

TABLE VII - BCVA OUTCOMES AFTER PPV FOR RLF

Series	Year	BCVA ≥ 20/40		BCVA ≤ 20/400	
		n	(%)	n	(%)
Gilliland	79-91	56	(50)		
Ross	90-94	46	(65)	8/46 (≤20/200)	(17)
Borne	91-94	121	(68)	18/121	(15)
Margherio	86-96	126	(44)	12/126 (<20/200)	(10)
Kim	92	62	(68)		
Vilar	93-95	126	(59.5)	25/126 (≤20/200)	(20)
Bessant	EYE-98	34	(50)		
Morel	JFrO-98	34	(41)		
Yeo	BJO-99	22	(59)		
This study	98-00	43	(56)	7/43	(16)

TABLE VIII - IOP OUTCOMES AFTER PPV FOR RLF

Series	Year	IOP≥ 30 Before PPV		IOP≥ 30 After PPV	
		n	(%)	n	(%)
Gilliland	79-91	56	(52)		(25)
Ross	90-94	54 (>25)	(46)		
Borne	91-94	121	(32)	18/121	(11)
Margherio	86-96	126 (>25)	(52)		(25)
Kim	90-92	62	(46)		
Vilar	93-95	126	(37)	4/126	(3)
Yeo	BJO-99	22	(86)	9/22	(41)
This study	98-00	43 (≥25)*	(61)	1/43	(2)

* With or without medication

PPV= Pars plana vitrectomy; BCVA= Best corrected visual acuity; IOP= Intraocular pressure; ARMD= Age related macular degeneration; RLF= Retained lens fragments

ferent (Tab. VIII), it is hard to make firm comparisons, but the various data give an idea about the ocular hypertension in such cases.

As we found no difference regarding timing, we assume that with the appropriate conditions for the surgical team and equipment, PPV and IOL implantation can be managed on the same day as cataract surgery, so as not to expose the patient to a second operation. If it is left for later it is important to inform the patient. Otherwise, as we observed, some cases – especially those not well informed about RLF – may fail to return for follow-up visits or even go to be seen by other colleagues who, seeing uveitic reactions and corneal edema, may prescribe corticosteroids, with the risk of raising the IOP and delaying essential therapy, mainly surgery. In suspicious cases with corneal edema preventing a view of fundus details, ultrasonographic examination is helpful. The vitreoretinal surgeon may decide to contact the cataract surgeon for a final decision. We think management is closely related to follow-up. Corneal edema, inflammation and ocular hypertension that cannot be managed with medication call for vitreoretinal surgery, and improvement is surprisingly quick, as we observed in our cases.

To conclude, vitreoretinal surgery is an effective method of removing RLF after phacoemulsification, lowering the IOP and reducing the uveitic reaction and corneal edema. BCVA ≥ 20/40 can be reached in at least half the patients.

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