

Risk factors for vitreous loss in cataract surgery

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PURPOSE. To evaluate the risk factors for posterior capsule rupture with or without vitreous loss (PCR±VL) in extracapsular cataract extraction (ECCE).

METHODS. The charts of 2794 consecutive patients who had ECCE with or without intraocular lens implantation between January 1992 and December 1997 were reviewed retrospectively. Probable risk factors included age, sex, operated eye (right or left), presence of diabetes mellitus, systemic hypertension, history of vitreous loss in the other eye (if operated), type of cataract, axial length of the eye, preoperative visual acuity, glaucoma, presence of pseudoexfoliation, preoperative shallow anterior chamber and experience of surgeon (resident, general ophthalmologist, cataract surgeon). We compared 192 patients who had PCR ± VL with complete data and 275 randomly selected patients who had no complications, using multiple logistic regression analysis.

RESULTS. Two hundred and fifty-four patients (9.09%) had PCR and 197 (7.05%) had PCR + VL. The surgeon's experience ($p < 0.0005$), glaucoma ($p < 0.005$), type of cataract ($p < 0.005$), presence of pseudoexfoliation ($p < 0.05$) and systemic hypertension ($p < 0.05$) were significant risk factors.

CONCLUSIONS. Patients with risk factors such as glaucoma, pseudoexfoliation, traumatic cataract and systemic hypertension should be operated by experienced surgeons. (*Eur J Ophthalmol* 2000; 10: 227-32)

KEY WORDS. Cataract surgery, Vitreous loss, Risk factors, Glaucoma, Pseudoexfoliation, Hypertension

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INTRODUCTION

Vitreous loss (VL) is one of the most important complications of cataract surgery.

Visually disabling late complications like cystoid macular edema, retinal detachment occur more frequently in cases complicated by VL (1). Many risk factors contribute to VL in cataract surgery, related to the surgeon, the surgical technique and the patient. In this study we aimed to assess the risk factors for posterior capsule rupture with or without vitreous loss (PCR±VL) in extracapsular cataract (ECCE) surgery. As we are changing our cataract extraction technique to phacoemulsification we hoped that defining the risk factors in extracapsular surgery with many years of

experience would help us select the easier cases for our first phaco procedures. This study also gives demographic data about cataract patients in a high-volume teaching hospital in Turkey.

PATIENTS AND METHODS

We retrospectively reviewed the charts of 2794 consecutive patients who had ECCE with or without intraocular lens (IOL) implantation between January 1992 and December 1997. To determine the risk factors for PCR±VL during ECCE, we randomly selected a sample of uncomplicated patients (group A) and compared them with patients who had PCR±VL (group B). Risk

factors studied included age and sex, operated eye (right or left), presence of diabetes mellitus, systemic hypertension, history of vitreous loss in the other eye (if operated), type of cataract, axial length of the eye, preoperative visual acuity, glaucoma, pseudoexfoliation, preoperative shallow anterior chamber and the surgeon's experience. Randomization was done by sorting all patients according to their chart numbers and including every tenth patient. If a selected patient had complicated surgery then the data was excluded.

Cataracts were divided into eight groups: 1-mature (white), 2- posterior subcapsular, 3- nuclear sclerosis, 4- mixed, 5- traumatic, 6- posterior polar, 7- intumescent, 8- hypermature. Patients with congenital cataracts were excluded. Polar cataracts were few so they were also excluded from analysis.

The surgeon's experience was classified as: 1- resident, 2- general ophthalmologist (at least five years of experience after residency training), 3- cataract surgeon (one surgeon).

Preoperative visual acuities were measured with Snellen charts and patients were grouped as follows: visual acuity <0.1, 0.1, and 0.2 or above. All of the patients had a dilated eye examination before surgery. The presence of pseudoexfoliation material was checked after pupillary dilatation. History of vitreous loss in the fellow eye was also recorded. Only one eye from each patient was included in the study.

The surgical technique was standard in all cases. Most of the patients had retrobulbar anesthesia. General anesthesia was reserved for children and mentally handicapped patients. Most patients had corneoscleral beveled incision and only a minority had a superior corneal incision. When pupillary dilatation was not satisfactory a sector iridectomy was done. Can-opener capsulotomy was followed by lens delivery through the incision and a posterior chamber IOL was implanted in the sulcus or capsular bag. The incision was closed with 10/0 nylon interrupted sutures. In cases with PCR+VL anterior vitrectomy was usually done and if there was enough capsular sup-

TABLE I - CHARACTERISTICS OF ALL PATIENTS WITH AND WITHOUT POSTERIOR CAPSULE RUPTURE (with or without vitreous loss)

	Patients with no complication n=2540	Patients with PCR+VL n=254	Total n=2794
Sex			
male	1412	139	1551
female	1128	115	1243
Age	61.0 ± 15.9 (4-78 years)	63.0 ± 13.8 (7-82 years)	62.2 ± 14.9
Operated eye			
right	1311	133	1444
left	1229	121	1350
Surgeon's experience			
resident	1034	172	1206
general ophthalmologist	504	44	548
cataract surgeon	1002	38	1040
Type of cataract			
1) mature (white)	711	62	833
2) post. subcapsular	224	72	296
3) nuclear sclerosis	591	13	604
4) mixed	578	61	639
5) traumatic	113	22	135
6) polar	30	4	34
7) intumescent	116	5	121
8) hypermature	117	15	132

PCR: Posterior Capsule Rupture; VL: Vitreous Loss

port, a posterior chamber IOL was placed. In case of inadequate capsular support, a 4-point touch anterior chamber IOL was implanted. If the fellow eye was aphakic or in patients with certain retinal problems, the eyes were left aphakic.

Before multiple logistic regression analysis, we univariately estimated the association of each independent variable with the clinical outcome by the chi-square test (with Yates correction when required) and Student's t-test. Only those variables associated with clinical outcome at a minimum of 85% significance ($p < 0.15$) were included in the multivariate logistic regression analysis (2). $P < 0.05$ was considered significant.

RESULTS

Of the 2794 patients, 254 (9.09%) had PCR and 197 (7.05%) had PCR+VL; 57 (22.5%) with PCR had posterior chamber IOL implantation, 106 (41.7%) had anterior chamber IOL implantation and 91 (35.8%) were left aphakic. Patients' main characteristics are listed in Table I. Of the 254 cases who had PCR±VL, 192 had complete data. These patients were compared with 275 randomly selected cases who did not have PCR±VL.

Thirteen possible risk factors were tested (Tab. II). When the data was analyzed with Student's t-test and

TABLE II - DISTRIBUTION OF RISK FACTORS IN GROUPS A AND B AND RESULTS OF UNIVARIATE ANALYSIS
(Student's t-test or chi-square test)

Variable	Group A n=275	Group B n=192	p value
1 - Age	63.9±15.9	64.3±14.9	.707
2 - Sex			.467
male	157	102	
female	118	88	
3 - Surgeon			.000
resident	104	122	
general ophthalmologist	13	40	
cataract surgeon	128	30	
4 - Operated eye			.614
right	136	99	
left	139	93	
5 - Axial length (mean±SD) mm	22.89 ± 0.97	23.09 ± 1.00	.991
6 - Preoperative visual acuity (Snellen)			.076
<0.1	250	165	
0.1	16	22	
0.2 and above	7	5	
7 - Glaucoma	11	21	.003
8 - Pseudoexfoliation	20	28	.010
9 - Shallow anterior chamber	7	9	.070
10 - Cataract types			.002
a) mature	82	41	
b) post-subcapsular	72	61	
c) nuclear sclerosis	9	9	
d) mixed	72	46	
e) traumatic	7	17	
f) intumescent	20	2	
g) hypermature	9	8	
11 - Diabetes Mellitus	40	18	.100
12 - Hypertension	37	41	.023
13 - History of vitreous loss in fellow eye			.441
(-) history of VL	46	39	
(+) history of VL	14	8	
Fellow eye not operated	215	144	

the chi-square test, the surgeon's experience the type of cataract, glaucoma, pseudoexfoliation and systemic hypertension significantly increased the risk ($p < 0.05$) whereas age, sex, axial length, operated eye (right or left), preoperative shallow anterior chamber, history of diabetes, history of vitreous loss in the fellow eye and preoperative visual acuity did not increase the risk of PCR±VL ($p > 0.05$).

When variables associated with clinical outcome at a minimum of 85% significance ($p < 0.15$) were included in the multivariate logistic regression analysis only the surgeon's experience, the type of cataract, glaucoma, pseudoexfoliation and systemic hypertension were significant (Tab. III).

The surgeon's experience was an important factor in the risk of VL in extracapsular surgery ($p = 0.0000$). There were respectively 22 and 9 residents and general ophthalmologists who had worked during those six years. Relative risks were analyzed in relation to

the cataract surgeon. With residents the risk of complications increased 5.02-fold and with general ophthalmologists 3.89-fold.

Another risk factor for VL was glaucoma. There were 21 patients with glaucoma in the PCR±VL group. Five (23.8%) had pseudoexfoliation glaucoma and the rest (76.2%) had primary open angle glaucoma. Two of 11 patients in the uncomplicated group (18.2%) had pseudoexfoliation glaucoma and one (9.1%) had phacomorphic glaucoma due to intumescent cataract, the remaining 72.7% had primary open angle glaucoma. Multiple logistic regression analysis showed that glaucoma increased the risk of PCR±VL 4.17-fold ($p < 0.005$).

The type of cataract also significantly affected the risk of PCR+VL ($p < 0.005$). Relative risks for each cataract group were analyzed with respect to the mature cataract group. Traumatic cataracts carried the highest risk, with a VL of 16.3% (22 of 135 cases). The increase

TABLE III - VARIABLES IN THE MULTIPLE LOGISTIC REGRESSION MODEL AND THEIR SIGNIFICANCE

Variables	p value	Exp (B)	95 % confidence interval	
			Lower limit	Upper limit
1 - Surgeon	.000			
resident	.000	5.02	3.03	8.30
general ophthalmologist	.000	3.89	2.06	7.31
cataract surgeon	-	-	-	-
2 - Glaucoma	.002	4.17	1.67	10.47
3 - Cataract types	.001			
a) mature	-	-	-	-
b) post-subcapsular	.12	1.54	.89	2.67
c) nuclear sclerosis	.33	1.70	.58	5.03
d) mixed	.52	1.20	.68	2.13
e) traumatic	.00	5.94	2.17	16.32
f) intumescent	.03	.17	.02	35.59
g) hypermature	.23	1.95	.65	5.90
4 - Pseudoexfoliation	.02	2.54	1.29	5.03
5 - Hypertension	.02	1.72	1.01	2.94

Exp(B) shows odds ratio

was 5.94-fold ($p=0.0009$). Intumescent cataract was significantly safe ($p<0.05$) but the numbers of intumescent cataracts were different in our sample of uncomplicated cases (Group A) and the 2540 patients. The standard error was high (0.80) and CI was very large so we did not take this significance into consideration.

Pseudoexfoliation significantly influenced the outcome ($p<0.05$). The relative risk of PCR±VL in patients in pseudoexfoliation was 2.54. Seven (14.6%) of 48 patients had capsular glaucoma and the rest had pseudoexfoliation syndrome.

Hypertension also significantly affected the surgical outcome in our logistic regression model ($p<0.05$), increasing the risk of VL by a factor of 1.72.

DISCUSSION

In our study, the surgeon's experience was highly correlated with the complication rate. Ours is a teaching hospital and although all of resident surgeries were staffed by experienced staff the complication rate, was still five times higher. In various studies posterior capsule rupture rates of residents range between 9% and 16% (3, 4). General ophthalmologists who do only a small amount of cataract surgery have a slightly higher complication rate but that may also be due to our comparing the results for nine general ophthalmologists with one cataract surgeon. Our most experienced surgeon had a VL rate compatible with the literature (5-8).

Glaucoma has been defined as a risk factor for VL in ECCE (7, 9). Drolsum et al reported that in their series glaucoma increased the VL rate 2.7-fold (9). In our series glaucoma increased the risk four times. There are several explanations for this higher risk. The cause of glaucoma, like capsular glaucoma or traumatic glaucoma, may carry a higher risk because of the etiology. In pseudoexfoliation weaker zonules and poor pupillary dilatation increase the complication risk. Also, chronic use of miotics may also predispose to synechia formation and poor dilatation.

We found that the type of cataract significantly affected VL. Among eight types, traumatic cataracts have a 5.9 times higher risk of causing VL in extracapsular surgery. With traumatic cataracts it is not infrequent to find defects in the posterior capsule or zonu-

lar ruptures. Chitkara et al also reported a significantly higher risk of VL in traumatic cataract cases (6).

Cataract surgery in eyes with pseudoexfoliation syndrome may run into complications because of weakness of lens zonules and because the pupil is so rigid and dilates poorly (10). Our study showed that eyes with pseudoexfoliation carried a 2.5-fold risk of VL in cataract surgery. Lumme et al reported that small pupil and exfoliation syndrome were the most important risk factors for both intra- and early postoperative complications (7). This risk was up to 4-5-fold in some studies (11, 12). Moreno et al reported that zonular weakness was greater in advanced stages of pseudoexfoliation syndrome and especially in patients with hypermature cataracts. To avoid capsular rupture the cataract should be operated on in an earlier stage than senile cataract (13).

In our study, systemic hypertension constituted a significant risk factor for VL, with a 1.7-fold higher complication rate. In hypertensive patients we do retrobulbar anesthesia without adrenaline which limits the effectiveness and duration of local anesthesia. This may indirectly affect the complication rate. However, since this was a retrospective study, we could not check the effectiveness of retrobulbar anesthesia. Unlike this study, several others that tested systemic hypertension as a risk factor for VL in cataract surgery found no significant relation (7, 14).

Age and sex did not influence the incidence of VL. This is compatible with most other large series (5, 7, 15). However, Drolsum et al reported significant relation between increasing age and presence of glaucoma, pseudoexfoliation, nuclear sclerosis and inadequate mydriasis which may indirectly increase the complication rate (16). However, KÜchle et al reported an increased risk of VL or patients younger than 41 years (14).

Other variables like operated eye (right or left), preoperative visual acuity, shallow anterior chamber, axial length, presence of diabetes mellitus and history of VL in the fellow eye did not significantly affect the rate of VL in ECCE. These findings agree with previous studies (5, 7). Only Chitkara et al found that diabetes mellitus increased the risk of VL (6).

According to this study, patients with glaucoma, pseudoexfoliation, traumatic cataracts, systemic hypertension and those operated by inexperienced surgeons have greater risk of PCR and VL. We conclude

that patients with those risk factors should be operated by more experienced surgeons and should be informed about the higher risk of complications. Taking these factors into consideration should help us limit complications in phacoemulsification.

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