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Clinical complications of combined phacoemulsification and vitrectomy for eyes with coexisting cataract and vitreoretinal diseases

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PURPOSE. *To discuss the intraoperative and postoperative complications of combining phacoemulsification and foldable intraocular lens (IOL) implantation with pars plana vitrectomy in eyes with significant cataract and coexisting vitreoretinal diseases.*

METHODS. *This retrospective study consisted of 186 eyes of 149 patients with various vitreoretinal abnormalities and visually significant cataracts. Vitreoretinal surgery was combined with clear corneal phacoemulsification and foldable IOL implantation. Main outcome measures were the intraoperative and postoperative complications at from 6 to 56 months.*

RESULTS. *The most common intraoperative complication was iatrogenic retinal hole (5.3%), transient corneal edema (3.2%), and posterior capsule break (2.1%). The most common postoperative complication was posterior capsule opacification (21.5%) and elevated intraocular pressure (9.7%), macular edema (8.1%), fibrinous reaction (6.9%), vitreous hemorrhage (3.7%), posterior synechiae (3.7%), and recurrent retinal detachment (3.2%). Postoperatively, in 162 eyes (87.1%), visual acuity improved by 3 lines or more on the Snellen chart. In 14 eyes (7.5%), vision remained within 3 lines of preoperative levels and in 10 eyes (5.3%), vision had decreased at the last follow-up.*

CONCLUSIONS. *Postoperative complications did not increase significantly in the combined phacoemulsification and vitreoretinal surgery. Combined vitreoretinal surgery and phacoemulsification with foldable IOL implantation is safe and effective in treating vitreoretinal abnormalities coexisting with cataract. Based on extensive experience with the combined procedure, the authors suggest that combined surgery is recommended in select patients having simultaneous vitreoretinal pathologic changes and cataract. (Eur J Ophthalmol 2009; 19: 37-45)*

KEY WORDS. *Cataract, Complications, Phacoemulsification, Vitrectomy*

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INTRODUCTION

Vitreoretinal abnormalities are frequently associated with cataracts in elderly patients. Cataracts increase in prevalence with age, as do vitreoretinal pathologies, such as macular holes, epiretinal membranes, and retinal detachments. The presence of cataracts will often necessitate a second operation soon after the vitreoretinal surgery if a lens extraction is not performed simultaneously with the vitreoretinal surgery. In addition, vitrectomy itself causes cataracts to progress. Therefore, cataract extraction is required in order to increase the chances for postoperative visual acuity improvement, to provide a better view of the retina intraoperatively, and to improve visualization of the retina postoperatively. Even if the cataract is not significant, it may progress postoperatively due to both vitreo-

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retinal surgery and intraocular tamponade. Combining phacoemulsification and IOL implantation with pars plana vitrectomy in eyes with significant cataract and coexisting vitreoretinal diseases is becoming increasingly common. Several studies have reported the authors' experience with combined surgery using a variety of techniques (1-3). In the present study, we evaluated the largest recent reports of complications after combined clear corneal phacoemulsification with foldable IOL implantation and vitreoretinal surgery in patients with cataract and miscellaneous retinal abnormalities.

METHODS

A total of 186 eyes of 149 patients who underwent combined vitreoretinal surgery and phacoemulsification with foldable IOL implantation were retrospectively analyzed. All patients had clinically significant lens opacities at the time of vitreoretinal surgery. The indications for vitreoretinal surgery were nondiabetic vitreous hemorrhage in 48 eyes (branch retinal vein occlusion in 30 eyes, central retinal vein occlusion in 3 eyes, Eales disease in 6 eyes, posterior vitreous detachment in 3 eyes, and other pathologic changes in 6 eyes [5 eyes had undergone vitrectomy previously]), proliferative diabetic retinopathy (PDR) in 42 eyes (7 eyes had undergone vitrectomy previously), retinal detachment with or without proliferative vitreoretinopathy (PVR) in 32 eyes, and macular pathology in 48 eyes, including macular hole (21 eyes), macular membrane (12 eyes), vitreomacular traction syndrome (10 eyes), and subfoveal choroidal neovascular membrane from age-related macular degeneration (5 eyes). Six eyes had preoperative ocular trauma (four eyes had penetrating ocular injury and two eyes had contusion injury). Ten eyes had other vitreoretinal abnormalities as indications for vitreoretinal surgery, including six eyes with uveitis and four eyes with acute retinal necrosis.

The preoperative clinical data obtained for each patient included age, gender, systemic diseases, preoperative visual acuity, intraocular pressure (IOP) measurement, slit-lamp biomicroscopy, fundus contact lens/indirect biomicroscopy, B-scan ultrasonography, optical coherence tomography (OCT), type and extent of cataract, vitreoretinal disease, and previous laser or intraocular surgeries. Intraoperative data included surgical incision site, vitreoretinal procedure performed, type of IOL, internal tamponade, and intraoperative complications.

The postoperative data obtained included visual acuity with postoperative refraction, length of follow-up, postoperative complications, fundus, and subsequent surgical procedures (e.g., vitreoretinal reoperation and neodymium: yttrium-aluminum-garnet [YAG] laser capsulotomy).

All patients were operated on by the same experienced surgeon (Dr. Li) between June 2002 and October 2007 at the Eye Hospital, Wenzhou Medical College, China. Patients with less than 6 months of follow-up were excluded. Phacoemulsification preceded vitreoretinal surgery in all cases. A 3-mm wide and 1.5–2.0-mm long clear corneal tunnel incision was created at the temporal limbus. After filling the anterior chamber with a viscoelastic substance, a 5–6 mm continuous curvilinear capsulorhexis was created, followed by phacoemulsification and cortex removal. The IOL was not implanted until the completion of posterior segment surgery. A standard three-port pars plana vitrectomy was performed using a contact lens viewing system for visualization. Vitreoretinal procedures performed included vitrectomy, peeling of the posterior hyaloid membrane, epiretinal and subretinal membrane peeling, photocoagulation, cryotherapy, diathermy, fluid–gas and oil–gas exchange, and gas or silicone oil injection. The vitrectomy was combined with preretinal and subretinal membrane peeling in 78 eyes (41.9%), including subretinal membrane in 32 eyes, subfoveal choroidal neovascular membrane removal in 5 eyes (2.6%), peripheral retinotomy in 18 eyes (9.6%), cryoretinopexy in 15 eyes (13.3%), encircling band in 26 eyes (13.9%), and internal tamponade in 92 eyes (45.1%), including air tamponade in 16 eyes, 20% perfluoropropane (C_3F_8) in 28 eyes, and silicone oil in 68 eyes. The acrylic foldable IOL (one-piece acrylic SA60AT for 103 eyes, MA60BM for 78 eyes, Acrysof, Alcon) was implanted in all eyes through a 3.5–4.0 mm wide corneal incision after internal tamponade was performed.

RESULTS

Indications for posterior segment surgery

We identified 186 eyes of 149 patients who fit study criteria. The mean age was 61.5 years (range, 19 to 89 years). The follow-up ranged from 6 to 56 months (mean, 11 months). The demographic data of the patients are presented in Table I. All eyes in the study had cataracts. The indications for vitreoretinal surgery are summarized in Table II.

Visual acuity

Preoperative visual acuity ranged from light perception to 20/40. Postoperative vision ranged from 20/20 to no light perception (mean, 20/50). Postoperatively, in 162 eyes (87%), visual acuity improved by 3 lines or more on the Snellen chart. In 14 eyes (7.5%), vision remained within 3 lines of preoperative levels and in 10 eyes (5.3%), vision had decreased at the last follow-up. The visual acuity of the patients is presented in Table III.

Complications

The most common intraoperative complication was iatrogenic retinal hole during membrane peeling in 10 eyes (5.3%), 5 eyes with PDR, 3 eyes with PVR, and 1 eye with nondiabetic vitreous hemorrhage and acute retinal necrosis.

TABLE I - DEMOGRAPHIC CHARACTERISTICS

Data	Patients (n = 149)
Mean age, yrs	61.5
Range	19–89
Male: female	71:78
Right eye: left eye	96:90
Systemic diseases, n (%)	
Diabetes mellitus	46
Hypertension	58
Cardiovascular	44
Parkinson disease	1

We divided postoperative complications into two groups: early (1 month or less after surgery) and late (more than 1 month after surgery). The most common early postoperative complication was elevated IOP on the first postoperative day in 18 eyes (9.7%; range, 24–38 mmHg). The most common late postoperative complication was PCO in 40 eyes (21.5%). The distribution of intraoperative and postoperative complications during and after combined surgery are presented in Tables IV and V.

At the end of the follow-up period, silicone oil had been removed from 68 eyes with silicone oil tamponade. In 25 eyes, the retina remained attached during follow-up, and 7 eyes developed retinal redetachment. In all seven eyes, the retina was reattached using repeated silicone oil tamponade.

DISCUSSION

In cases in which cataracts coexist with vitreoretinal disease, surgeons have struggled to optimize retinal visualization during vitreous surgery and improve postoperative visual rehabilitation for their patients while minimizing complications. This study reported the results of combined phacoemulsification and pars plana vitrectomy performed during one session. The indication for combined surgery in this study was the coexistence of vitreoretinal disease and a significant cataract that obscured visualization.

With regard to intraoperative complications, the most common complication was an iatrogenic retinal hole dur-

TABLE II - INDICATIONS FOR POSTERIOR SEGMENT SURGERY AND COMPARISON WITH PREOPERATIVE AND POSTOPERATIVE VISUAL ACUITY IN EACH CATEGORY OF PATIENTS (ANOVA)

Indications	No. of eyes	% Total	F	p
Nondiabetic vitreous hemorrhage	48	25.5	149.936	0.000
PDR	42	22.5	41.411	0.000
Retinal detachment with or without PVR	32	17.2	22.453	0.000
Macular hole	21	11.3	17.241	0.000
Macular membrane	12	6.4	23.153	0.001
Vitreomacular traction syndrome	10	5.3	22.666	0.001
Subfoveal choroidal neovascularization	5	2.6	6.410	0.065
Ocular trauma	6	3.2	7.328	0.042
Uveitis	6	3.2	5.340	0.069
Acute retinal necrosis	4	2.1	8.713	0.060
Total	186	100		

PDR = proliferative diabetic retinopathy; PVR = proliferative vitreoretinopathy.

TABLE III - PREOPERATIVE AND POSTOPERATIVE BCVA OF THE PATIENTS

Visual acuity	Preoperative, n (%)	Postoperative, n (%)
NLP	—	3 (1.6)
LP–FC	68 (36.5)	10 (5.3)
20/400	44 (23.6)	14 (7.5)
20/200	46 (24.7)	52 (27.9)
20/100–20/50	21 (11.3)	76 (40.8)
20/40–20/20	7 (3.7)	31 (17.2)

NLP = no light perception; FC = finger counting.

ing membrane peeling, which occurred in 10 eyes (5.3%) and was managed successfully with immediate endolaser. Kim and coauthors reported that 6 eyes (30%) that had combined surgery for PDR developed an iatrogenic retinal hole intraoperatively (4). In contrast, an intraoperative retinal tear (2.5%) from combined surgery developed in Case 40 and was managed successfully with immediate endolaser (5).

Transient corneal edema in 6 eyes (3.2%), in which the edematous epithelium was scraped, resulted in corneal epithelial defects in 4 eyes (2.1%) due to the influence of

TABLE IV - DISTRIBUTION OF INTRA- AND POSTOPERATIVE COMPLICATIONS DURING AND AFTER COMBINED SURGERY DEPENDING ON VITREORETINAL DISEASE AND TAMPONADE

	Vitreoretinal disease											Tamponade		
Complications	**NVH**	**PDR**	**PVR**	**MH**	**MM**	**VT**	**SCN**	**OT**	**U**	**ARN**	**NOT**	**No.**	**Air/gas**	**Silicone oil**
Intraoperative														
CE	1	5	2								1	9	4	3
CED		3	1									4	3	1
PCB	2	1						1			2	6	1	1
IRH	1	5	3							1		10	3	7
IH	1	3								1		5	1	4
Early postoperative														
CE	2	6	4	3							2	17	8	5
CED	1	4	2									7	4	3
ACH	1	2	1									4	3	1
FR	2	4	5						1	1	1	14	5	7
EIP	5	3	4	2	1	1	1	1			2	20	9	7
VH	1	3	2							1	2	9	4	1
CD	1		2									3		3
CME	2	3	3	1	2	1	2		1		3	18	5	7
Late postoperative														
RI	1	2	1						1			5	1	4
PS	1	3	3								1	8	2	4
PCO	11	13	9	1	1	1			2	2	7	47	12	21
IOLD	1		1					1				3	1	2
NVG	1	2	1									4	2	2
EM		3	2									5	2	3
RRD	1	2	3								1	7	2	3
PMH		2	2	5	1						3	13	2	5
MPC			1		1	1	2					5	2	3
H		1	2									3	1	2
VH	2	4	1								1	8	4	2
K		1	1									2		2
Total	37	78	56	12	6	4	5	3	5	6	29	236	81	103

NVH = nondiabetic vitreous hemorrhage; PDR = proliferative diabetic retinopathy; PVR = retinal detachment with or without proliferative vitreoretinopathy; MH = macular hole; MM = macular membrane; VT = vitreomacular traction; SCN = subfoveal choroidal neovascularization; OT = ocular trauma; U = uveitis; ARN = acute retinal necrosis; NOT = no tamponade; CE = corneal edema; CED = corneal epithelial defects; PCB = posterior capsule break; IRH = iatrogenic retinal hole; IH = intraocular hemorrhage; ACH = anterior chamber hyphema; FR = fibrinous reaction; EIP = elevated intraocular pressure; CD = choroidal detachment; CME = cystoid macular edema; RI = rubeosis iridis; PS = posterior synechiae; PCO = posterior capsule opacification; IOLD = IOL dislocation; NVG = neovascular glaucoma; EM = epiretinal membrane; RRD = recurrent retinal detachment; PMH = persistent macular hole; MPC = macular pigmentary change; H = hypotony; K = keratopathy.

TABLE V - SURGICAL COMPLICATIONS (N = 186)

Complications	No. of Eyes	% Total
Intraoperative		
Iatrogenic retinal hole	10	5.3
Corneal edema	6	3.2
Vitreous hemorrhage	5	2.7
Corneal epithelial defects	4	2.1
Posterior capsule break	3	1.3
Early postoperative		
Elevated intraocular pressure	18	9.7
Corneal edema	15	8.1
Macular edema	15	8.1
Fibrinous reaction	13	6.9
Vitreous hemorrhage	7	3.7
Corneal epithelial defects	7	3.7
Anterior chamber hyphema	4	2.1
Choroidal detachment	3	1.6
Late postoperative		
Posterior capsule opacification	40	21.5
Persistent macular hole	10	5.3
Posterior synechiae	7	3.7
Vitreous hemorrhage	7	3.7
Recurrent retinal detachment	6	3.2
Epiretinal membrane	5	2.6
Macular pigmentary change	5	2.6
Rubeosis iridis	5	2.6
Neovascular glaucoma	4	2.1
IOL dislocation	3	1.3
Hypotony	3	1.3
Keratopathy	2	1.1

surgical procedures, except in 2 eyes which the transient corneal edema resolved within one week of surgery. Previous authors have advocated avoiding corneal tunnels in diabetic patients owing to concerns of increased risks of delayed healing and epithelial complications (6, 7). However, we found no instance of wound leaks, delayed healing, or persistent epithelial defects in our diabetic patients and others. Five patients (2.7%) had intraocular hemorrhage during surgery, which was treated with internal bipolar cautery or/and elevated intraocular pressure. Posterior capsule breaks occurred in 4 eyes (2.1%), as has been reported in other studies in which the rate of posterior capsule breaks during the combined surgery ranged from 1.8 to 5.5% (8, 9).

With regard to postoperative complications, the early common complications included the following: elevated IOP in 9.7% of eyes, mild or significant transient corneal edema in 8.1% of eyes, macular edema in 8.1% of eyes, fibrinous reactions in 6.9% of eyes, posterior synechiae in 3.7% of eyes, and vitreous hemorrhage reoccurred in 3.7% of eyes.

Elevated IOP was the most frequent early postoperative complication of combined surgery, with an incidence ranging from 4.4 to 23.8% (1, 9-11). This was similar to the results in our study, in which we reported that the incidence of elevated IOP after combined surgery was 9.7%.

Treumer analysis revealed fibrinous exudation in the anterior chamber to be significantly more frequent after combined surgery, particularly in cases of PDR (12). Thirteen patients (6.9%) in our series had small, segmental synechiae of the iris to the anterior capsule. Although there is an increase in inflammation following combined surgery, topical steroids appear to be effective in bringing it under good control soon after the surgery. Factors predisposing to fibrin reaction include multiple surgical procedures, such as retinocryopexy, excessive endolaser photocoagulation, large retinotomy, diabetes, and internal tamponade (especially silicone oil). Except for the posterior synechia which occurred in five cases, anterior chamber fibrin resolved with topical steroids and nonsteroidal anti-inflammatory drugs and there were no organized fibrin membranes or anterior PVR complications postoperatively. Of 113 patients in Jun et al's series, 16.8% (19 eyes) developed anterior chamber fibrin during follow-up (9). In Pollack et al's series, mild fibrinous reactions progressed in 11.2% of 42 eyes (11); however, Demetriades et al reported an incidence of only 4.0% of fibrin anterior chamber inflammation after combined surgery on 122 eyes (1). The incidence of these complications in our study was comparable to that in other studies in which vitrectomy was combined with phacoemulsification; based on our anecdotal experience, it is more common in children and in patients with diabetes or uveitis.

One previous report in a series of seven cases of combined surgery for macular holes found a 43% incidence of clinical and angiographic cystoid macular edema after combined surgery (13).We were particularly careful to identify patients who developed cystoid macular edema after combined surgery. Only 15 patients (8.1%) in our study had clinically significant cystoid macular edema after combined surgery. All cases had improvement of vision and resolution of edema with topical and posterior sub-Tenon steroids and time. This was similar to the results in another study, which reported that the rate of cystoid macular edema after the combined surgery was 9% (14).

Fifteen patients (8.1%) experienced an immediate postoperative mild or significant transient corneal edema on the day after surgery, 12 of 15 eyes related to elevated IOP, as long as if only the elevated IOP was controlled, the transient corneal edema was relieved within 1 week after surgery. In 3 other cases, the corneal edema could not be treated because of elevation of the IOP. Nevertheless, our results support findings of other similar studies, in which it has been reported that the incidence of corneal edema ranges from 4.4 to 44.4% (1, 8-9).

In our study, significant early postoperative inflammation developed in 7 eyes (3.7%), causing posterior synechiae to the anterior capsulorhexis despite the use of topical steroids for >1 month. Posterior synechiae has been described as a complication of the combined procedure; similar results were obtained by three groups of investigators who described the rate of posterior synechiae as 4.4, 9.0, and 9.5% after combined surgery (9, 11, 14).

In our series, vitreous hemorrhage recurred in the early and late postoperative period in 7 eyes (3.7%) and 14 eyes (7.5%), respectively. Previous studies (1, 2, 9, 11) have reported the incidence of recurrent vitreous hemorrhage between 2.6 and 11%; it was most common in patients with diabetes (2).

Additionally, except for the abovementioned early postoperative complications, the other complications included the following: anterior chamber hyphema occurred in 4 eyes (2.1%) and absorbed spontaneously within 2 weeks of surgery; corneal epithelial defects were encountered in 7 eyes (3.7%), which improved with a therapeutic lens and frequent artificial tears application; and one of the infrequent early postoperative complications was choroidal detachment in 3 eyes (1.6%), which subsided after administration of topical and systemic corticosteroids, or both, within 2 weeks after surgery.

Opacification of the posterior capsule has been mentioned as a frequent postoperative anterior segment complication in eyes treated with combined surgery (15). We found a relatively high rate of PCO in our series; specifically, in 40 of 186 eyes (21.5%) that did not undergo primary capsulectomy at the time of surgery, PCO was the most common late postoperative complication in our series. Previous studies indicated that PCO was the most frequent complication of combined surgery, with an incidence ranging from 2.2 to 28.4% (1, 10, 11). PCO is more common in children and in patients with diabetes or uveitis (16). In combined anterior and posterior segment surgery, the occurrence of PCO may be greater due to the longer duration of surgery, increased manipulation, and greater inflammation that occurs in these eyes. In addition to the visual consequences, PCO may interfere with examination of the retinal periphery (5). Our technique attempts to decrease the occurrence of this complication by polishing the anterior capsule to remove residual epithelial cells and by using a hydrophobic acrylic IOL, which has been reported to have a PCO rate as low as 2.2% (17-19).The IOL material may play an important role in PCO. Hollick et al compared the effect of PMMA, silicone, and acrylic IOL on PCO. The YAC capsulotomy rate was 0% for polyacrylic, 14% for silicone, and 20% for PMMA IOLs. Intraocular lenses made of polyacrylic were associated with a significantly lower YAG capsulotomy rate. The truncated edge of the acrylic IOL is believed to be responsible for the lower incidence of PCO. The barrier effect of the square optic edge, in addition to the material itself, may affect lens epithelial cell migration over the visual axis (20). The future will show if new IOLs with square-edge optics made from material other than acryl will also result in less PCO and lower YAG rates.

Except for PCO, one of the common and vision-threatening late postoperative complications in our series was recurrent retinal detachment. Six eyes (3.2%) experienced postoperative retinal detachment, which occurred in all cases that had been operated on for retinal detachment, except the eye with nondiabetic vitreous hemorrhage. We believe this low incidence is the result of complete delamination of fibrovascular tissue and the proliferative member in most cases, scleral depression allowing removal of traction from more anterior fibrovascular and proliferative member epicenters, and routine indirect laser to the anterior retina in all cases. Similar results were obtained in large studies involving 113, 122, and 223 cases (1, 9, 17). Nonetheless, four of the six eyes with recurrent retinal detachment remained attached following additional surgery.

Neovascular glaucoma (NVG) has been described as a complication of the combined procedure (15, 21). We encountered NVG in 4 eyes (2.1%) in our series. Similar results were obtained in a large study of 113 and 223 cases (2, 9). We believe this is the result of careful preoperative examination of the iris for neovascularization, and most importantly, the use of an endolaser and indirect laser photocoagulation. All patients were given additional PRP with the indirect laser at the end of vitrectomy to treat the anterior retina and to fill in areas previously untreated. NVG could be an important postoperative complication in patients with PDR after vitrectomy and lensectomy.

Mechanisms responsible for development of NVG include destruction of the barrier between the anterior and posterior segments of eyes, anterior diffusion of vasoproliferative substance, and oxygen steel in which the anterior chamber oxygen diffuses posteriorly into the vitreous cavity (22). Combined phacoemulsification with lens implantation could reduce the risk of NVG because the barrier between the anterior and posterior segments is established and panretinal photocoagulation is completed intraoperatively. Retention of an intact posterior capsule has been described as valuable in previous series of diabetic eyes to reduce the likelihood of NVG (23). Nevertheless, anterior segment neovascularization should remain a consideration for surgeons treating severe cases of PDR.

Rubeosis iridis was present late postoperatively in 5 eyes (2.6%). Combined phacoemulsification, IOL implantation, and vitrectomy have been reported to yield a satisfactory visual outcome and lower incidence of postoperative rubeosis (11, 24). However, there are concerns about a possible increased risk for rubeosis and NVG in patients with PDR when cataract surgery is combined with a vitrectomy. Heimann et al (25) and Castellarin et al (26) reported that from 6 to 16% of patients who had vitrectomy and silicone oil tamponade for PDR developed de novo rubeosis iridis. Five eyes in our study developed this complication, and three developed NVG. Furthermore, rubeosis iridis regressed after another surgery in 60% of our patients. This is similar to the results in another study, which reported that the regression rate of rubeosis iridis after phacoemulsification and foldable IOL lens implantation combined with vitrectomy and silicone oil tamponade for severe PDR is 50% (4).

Fibrin was absorbed following the topical use of steroids, although posterior synechiae were observed in 7 eyes (3.7%) and dislocation of the posterior chamber IOL in 3 eyes (1.3%).

To avoid postoperative gas-related complications, we also recommend constricting the pupil with a miotic at the conclusion of the procedure. Postoperatively, we suggest dilating gas-filled eyes once daily with short-acting agents, such as 1% tropicamide, rather than with long-acting agents, such as atropine. This, combined with topical corticosteroids, may help prevent formation of synechiae and minimize the chance of pupillary capture by the IOL.

The visual results in this study were very much what we expected from a series of vitreoretinal procedures of this nature. In 162 eyes, visual acuity improved by 3 lines or more on the Snellen chart in 87% of the eyes, but varied within the different groups of patients. Similar results (84.6%) in postoperative visual improvement were reported by Chung et al (27); in 7 eyes, vision remained within 3 lines of the preoperative levels, and in 10 eyes, vision had decreased at the last follow-up. Honjo and OgLira (3) reported improvement in the postoperative visual acuity by 2 lines or more in 78% of operated eyes, while Demetriades et al (1) reported postoperative visual improvement in 105 of 122 (86.1%) patients. The latter two series most likely included eyes with less severe initial maculopathy. In the cases in which vision decreased, the decrease was judged to be on the basis of progressive retinal deterioration from the underlying disease process or capsular opacification. In the current study, the major cause of decreased visual acuity was maculopathy, particularly in cases of recurrent complicated retinal detachment and/or severe diabetic retinopathy or capsular opacification. Toda et al found significantly more extensive PCO after combined surgery than after cataract surgery alone (28). After combined cataract surgery, eyes can also develop severe postoperative inflammation; this inflammation probably leads to more extensive PCO. To prevent PCO, we polished the anterior and posterior capsule after phacoemulsification thoroughly by using an irrigation/aspiration device in all eyes. Recently, further work subjected to meta-analysis demonstrated that the rates of PCO and Nd:YAG laser capsulotomy may be influenced by different IOL biomaterials and optic edge designs. The lenses made by acrylic and silicone and those with sharp optic edges are superior in lowering the rates of PCO and laser capsulotomy (29).

Visual acuity improvement is mainly dependent on macular pathology. In our study, the majority of patients who had had surgery for nondiabetic vitreous hemorrhage, macular diseases, macular-on retinal detachment, and epiretinal membranes experienced improvement in visual acuity after combined surgery. In contrast, visual improvement was less commonly seen in patients previously treated for macula-off retinal detachment, serious PVR, and PDR. These patients are more likely to have impaired macular function, and should therefore be given a guarded prognosis for cataract surgery.

Our series has the following limitations. It was uncontrolled, noncomparative, and represents only one surgeon's initial experiences. An additional drawback was the retrospective nature of the series. In particular, cases were preselected to be favorable for combined procedures.

In summary, our results show that postoperative complications did not increase significantly in the combined phacoemulsification and vitreoretinal surgery. Furthermore, combined surgery enables better visualization for the surgeon, reduces the need for a second operation, decreases costs, and allows early postoperative visual rehabilitation for the patient. Based on extensive experience with the combined procedure, we suggest that combined surgery is recommended in selected patients having simultaneous vitreoretinal pathologic changes and cataracts.

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