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Surgical results of pars plana vitrectomy combined with phacoemulsification

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Abstract: Objectives: To evaluate the technical feasibility, safety, outcome, and incidence of complications after combined clear corneal phacoemulsification (PEA) with intraocular lens (IOL) implantation and vitreoretinal surgery. Methods: Combined operations of PEA and PPV were performed on 52 eyes of 52 patients with cataract and vitreoretinal diseases. Results: The mean follow-up time was (10.3±2.8) months. Postoperatively, visual acuity improved in 46 eyes (88.5%); was unchanged in 6 eyes (11.5%). The best-corrected visual acuities (BCVAs) were the following: 20/40 or better (9 eyes), 20/50 to 20/100 (24 eyes), 20/200 (5 eyes), 20/400 (10 eyes), and fingers counting (FC) to light perception (LP) (4 eyes). In 38 eyes BCVA was 20/200 or better, and in 9 eyes it was 20/40 or better postoperatively. Postoperative complications included posterior capsual opacification (7 eyes); secondary glaucoma (1 eye); and retinal detachment (2 eyes). Conclusion: Although further studies are indicated, our study suggests that the combined operation of PPV, PEA and IOL implantation is safe and effective for patients. The visual outcome and complications depended primarily on underlying posterior segment pathology and were not related to the combined procedure technique.

Key words: Vitrectomy, Phacoemulsification (PEA), Cataract
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INTRODUCTION

Cataract is frequently associated with vitreoretinal pathology such as vitreous hemorrhage, retinal detachment, proliferative vitreoretinal disease, especially in patients with diabetes mellitus, ocular trauma and elderly population (Vatavuk and Pentz, 2004; Vatavuk *et al*., 2005). The cataract can be removed together with vitrectomy or later on in a separate surgical procedure (Tyagi *et al*., 1998; Lam *et al*., 1998). The primary indication for the primary removal of cataract and vitrectomy is significant lens opacification that diminishes visualization of the posterior segment and hinders the operations (Tyagi *et al*., 1998; Lam *et al*., 1998; Hurley and Barry, 1996). The methods for removal of cataracts include lensectomy (Tyagi *et al*., 1998; Slusher *et al*., 1992), extracapsular cataract extraction (Lamkin *et al*., 1992; Soheilian *et al*., 1995), and phacoemulsification (Koenig *et al*., 1990; 1992; Mamalis *et al*., 1991). Lensectomy is the removal of the cataract during a vitrectomy procedure. It is performed either with a vitrectomy probe, or a phacofragmentor. The lens is usually removed completely, with its anterior and posterior capsule. Extracapsular cataract extraction is performed through an 8-mm corneal, or corneoscleral, incision. The anterior lens capsule is removed, and the nucleus is mechanically expressed through the incision. Intraocular lens is implanted in the capsular bag. The incision must be sutured at the end of the procedure. Phacoemulsification is performed through a 3.5-mm corneal incision. The nucleus of the lens is aspirated with an ultrasound probe. A foldable intraocular lens is implanted in the capsular bag. The incision requires no suturing at the end of the procedure. Phacoemulsification has many advantages over lensectomy and extracapsular cataract extraction (Koenig *et al*., 1990). Smaller incision induces less

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astigmatism, makes the globe more stable, and decreases the possibility of a wound leak. Postoperative rehabilitation is also faster (Scharwey *et al*., 1999). In the current study, we retrospectively analyzed a consecutive series of 52 eyes in which vitreoretinal surgery was combined with clear corneal phacoemulsification.

PATIENTS AND METHODS

Between May 1996 and December 2000, we recorded 52 patients (52 eyes) who had pars plana vitrectomy (PPV) combined with clear corneal phacoemulsification. Visual and surgical results, as well as complication rates in these 52 consecutive cases, were retrospectively analyzed.

The following preoperative information was obtained for each patient: age, sex, visual acuity, intraocular pressure (IOP), and indication for vitreoretinal surgery. Keratometry and axial length measurements were performed on the eye to be operated on whenever possible. If this was not possible, the data were taken form the fellow eye. Intraocular lens calculation was performed using the Binkhorst formula. The type of cataract extraction and all posterior segment procedures were noted, including IOL style, haptic location, and type of anesthesia. Information regarding best-corrected visual acuity, refractive error, and ophthalmic findings were recorded by slit-lamp microscopy, tonometry and ophthalmoscopy were recorded before and after surgery.

Postoperative data included length of followed-up, reasons for PPV, best-corrected visual acuity (BCVA), and subsequent postoperative procedure (e.g., vitreoretinal reoperation, yttrium-aluminum-garnet (YAG) laser capsulotomy).

In all patients, surgery was performed using retrobulbar and subconjunctival anesthesia. In all 52 cases, cataract extraction preceded vitreoretinal surgery. A 3.0 mm wide and 1.5~2.0 mm long clear corneal tunnel was created at the temporal limbus, a 5.0 to 6.0 mm curvilinear capsulorhexis was completed, and phacoemulsification and cortex removal were performed. The anterior chamber and capsular bag were filled with occucoate, and the corneal tunnel was temporarily closed with a single 10-0 nylon suture.

Subsequently, a standard 3-port pars plana vitrectomy was performed using a 20-gange vitreous cutter and hand-held light pipe. Sclerotomies were placed 3.5 mm posterior to the limbus in the superotemporal, superonasal and inferotemporal quadrants. The infusion cannula was sutured in the inferotemporal selerotomy site.

After the vitreoretinal surgery was completed and before intraocular tamponade was performed, the foldable silicone IOL was implanted in 10 cases. During implantation, the sclerotomies were left open. The corneal suture was removed and a foldable silicone IOL was implanted through a 3.5 mm corneal incision. The corneal incision was water-sealing and the internal tamponade was performed. Sclerotomies and conjunctive were sutured, and subconjunctival gentamicin sulfate (20 mg) and dexamethasone sodium phosphate (4 mg) were administered.

RESULTS

Follow-up duration

The follow-up was between 6 and 41 months (means (10.3±2.8) months).

Patients demographics

Fifty-two eyes of 52 patients who had pars plana vitrectomy combined with clear corneal phacoemulsification (PEA) were recruited and analysed. The baseline demographics of the patients are summarized in Table 1.

Table 1 Baseline demographics of 52 patients who had combined PEA with PPV

	All eyes (*n*=52)
Age (years)	55.4 (34~77)
Gender	
Male	*n*=28
Female	*n*=24
Duration of symptoms (d)	322.1 (2~1825)
Diseases	
RRD with PVR	*n*=18
Macular hole	*n*=9
Diabetic retinopathy	*n*=12
Trauma	*n*=13
BCVA	LP~FC

RRD: Rhegmatogenous retinal detachment; PVR: Proliferative vitreoretinopathy; BCVA: Best-corrected visual acuity; LP: Light perception; FC: Fingers counting

Clinical course of the patients

Vitrectomy was combined with membrane removal in 18 eyes (34.6%), endolaser photocoagulation in 23 eyes (44.2%), scleral buckling in 34 eyes (65.4%), and removal of an intraocular foreign body embedded in the retina in 4 eyes (7.7%). Gas tamponade in 16 eyes (30.8%), and silicone oil tamponade in 9 eyes (17.3%) (Table 2).

Table 2 Clinical course of the patients

	Number of eyes (*n*/%)
Vitrectomy combined with membrane removal	18/34.6
Endolaser	23/44.2
Buckling	34/65.4
Intraocular foreign body removal	4/7.7
Gas temponade	16/30.8
Silicone oil temponade	9/17.3

Visual acuity

Postoperatively, visual acuity improved in 46 eyes (88.5%); was unchanged in 6 eyes (11.5%) because of: 1 with long-standing (5 years) retinal detachment, 1 with macular hole, 1 with severe trauma, 3 with diabetic retinopathy VI. The best-corrected visual acuity (BCVA) were the following: 20/40 or better (9 eyes), 20/50 to 20/100 (24 eyes), 20/200 (5 eyes), 20/400 (10 eyes), and fingers counting (FC) to light perception (LP) (4 eyes). In 38 eyes BCVA was 20/200 or better, and in 9 eyes it was 20/40 or better postoperatively (Table 3).

Table 3 Preoperative and postoperative BCVA of the patients

	Preoperative (*n*)	Postoperative (*n*)
LP~FC	52	4
20/400	0	10
20/200	0	5
20/100~20/50	0	24
20/40~20/20	0	9

Complications

No hyphema and fibrin transudation occurred in anterior chamber. Seven eyes developed posterior capsule opacification 3 months, 5 months, 6 months, 12 months, 13 months postoperatively. An Nd:YAG capsulotomy was performed in all. One eye with retinal detachment 3 weeks postoperatively, the retinal hole was the bed of the retinal foreign body, requiring a retinal reattachment, one eye with retinal redetachment 4 months after silicone oil removal. Secondary glaucoma occurred 5 weeks after silicone oil tamponade, requiring silicone oil removal.

DISCUSSION

Vitreoretinal pathology is frequently associated with cataract, and can accelerate the development of cataract. As the same time, cataract interferes with safe performance of vitrectomy, postoperative observation and postoperative treatment: retinal photocoagulation, separate anterior and posterior segment surgeries are the traditional methods. Kokame *et al*.(1989) reported a method of pars plana lensectomy in which the anterior lens capsule is left in place, allowing insertion of a posterior chamber IOL in the ciliary sulcus. Several other techniques for cataract removal during vitreoretinal surgery have been advocated, including intracapsular cataract extraction (ICCE), extracapsular cataract extraction (ECCE), both of which require a large incision, increase the risk of wound dehiscence caused by globe manipulation during posterior segment procedures. Both methods may also increase postoperative ocular inflammation. Combined surgery comprising phacoemulsification, intraocular lens (IOL) implantation, and pars plana vitrectomy (PPV) has been regarded as a safe and effective procedure (Amino and Tanihara, 2002; Lahey *et al*., 2003). This type of combined surgery is now considered a standard procedure for selected patients with clinically significant cataract and vitreoretinal diseases (Pinter and Sugar, 1999; Chang *et al*., 2005).

We used the phacoemulsification-vitrectomy-IOL insertion combined operation sequence. A clear corneal incision was made for cataract removal and IOL insertion and this incision was sutured before the pars plana vitrectomy was done. There were no complications related directly to IOL implantation at the time of vitreoretinal surgery (Scharwey *et al*., 1999; Honjo and Ogura, 1998).

In our experience, clear corneal phacoemulsification can be safely combined with vitreoretinal surgery. This cataract extraction technique is rapid and does not increase operating time significantly. As

the incision is performed in avascular tissue, there is no additional bleeding into the anterior chamber, and a postoperative inflammatory reaction is minimal. The incision is small, watertight and very resistant to increase IOP and globe manipulations during subsequent vitreoretinal surgery. In contrast to scleral tunnel incision, corneal incision does not interfere with sclerotomies, even if sclerotomy has to be enlarged. Endothelial opening of the corneal incision is remoter from the iris, reducing the risk of iris incarceration in the cataract incision. Trauma to the iris with the phaco trip is also minimized, decreasing the risk of intraoperative miosis.

Intraocular lens implantation should be delayed until the end of posterior segment surgery to maintain the advantages of small, self-sealing corneal incision and to avoid disturbing light reflexes from the IOL rim (causing difficulties in visualization of the far retinal periphery).

According to our clinical experience, the operation that combines cataract extraction, IOL implantation, and vitreous surgery is a safe and desirable option in patients with significant lens opacities and vitreoretinal pathology. And the main advantage of combined procedure is more rapid visual rehabilitation with a single operation, reducing coasts and patient discomfort.

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