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Combined pars plana vitrectomy, phacoemulsification and intraocular lens implantation for complex vitreoretinal diseases

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Abstract

• AIM: To evaluate the visual outcomes and safety of combined pars plana vitrectomy (PPV), phacoemulsification, and intraocular lens(IOL) implantation in the treatment of complex vitreoretinal diseases.

• METHODS: Retrospective consecutive interventional case series. 137 eyes of 122 patients underwent combined PPV, phacoemulsification, and IOL implantation. Main outcome measures were visual acuity and complications.

• RESULTS: The mean follow-up was 12. 8 months. The main vitreoretinal surgical indications were rhegmatogenous retinal detachment, tractional retinal detachment and proliferative diabetic retinopathy. In total, 37 eyes (27. 0%), 55 eyes (40. 1%) and 61 eyes (44. 5%) gained two or more lines of vision compared with baseline at 1 month, 6 months and 12 months follow-up.

• CONCLUSION: Combined PPV, phacoemulsification, and IOL implantation was safely and effectively used for cataracts and a variety of complex vitreoretinal diseases.

• KEYWORDS: combined surgery; pars plana vitrectomy; phacoemulsification; intraocular lens implantation; complex vitreoretinal diseases

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INTRODUCTION

Cataract formation is frequently coexisting with vitreoretinal disease and is a predictable consequence of either vitreoretinal surgery or intraocular tamponade. Pars plana vitrectomy (PPV) alone may result in blurred intraoperative and postoperative view to retina, restricted access to peripheral vitreoretinal pathology and unintended damage to the crystalline lens[1]. Phacoemulsification in vitrectomized eyes is often difficult due to loss of vitreous counterpressure, abnormal fluctuations in the anterior chamber depth, unstable posterior capsule and flaccid zonules. Combined surgery potentially can hasten visual recovery and prevent physical risks and medical costs of a second surgery in patients. Combined surgery has long been described as a valid treatment for various vitreoretinal disorders[2-4]. The purpose of this retrospective case series was to assess the anatomical as well as functional outcomes of combined PPV, phacoemulsification with intraocular lens (IOL) implantation for complex vitreoretinal diseases.

MATERIALS AND METHODS

Patients Consecutive cases referred to the senior investigators for assessment of eligibility. A total of 137 eyes of 122 patients were enrolled in the study. The mean age of the patients was 58. 9 (range 37 to 82) years. The mean follow-up was 12. 8 (range 3 to 18) months. The indications for phacovitrectomy include retinal detachment, proliferative retinopathy, macular pathology, vitreous hemorrhage, and others.

Interventions Preoperative clinical data obtained for each patient included details of age, gender, systemic diseases. At baseline, all patients underwent a full ophthalmologic examination, including best-corrected visual acuity (BCVA), slit-lamp biomicroscopy, intraocular pressure (IOP), indirect ophthalmoscopy, A-scan ultrasonography, B-scan ultrasonography, optical coherence tomography (OCT) and IOL Master.

All the operations were performed by a single surgeon. The surgical procedure consisted of a phacoemulsification (3. 0mm superior clear corneal incision, 5. 0 to 6. 0mm curvilinear capsulorhexis), followed by a standard three-port PPV using 20-gauge instrumentation with a bimanual technique and a wide-angle viewing system. It included removal of the posterior and peripheral vitreous body, relieving the vitreous traction around the break, fluid-air exchange with internal drainage of subretinal fluid through either break or retinotomy, retinopexy applied using endolaser or cryotherapy according to the position of the retinal breaks, and a potential endotamponade with perfluoropropane or silicone oil for all eyes included in the study. The IOL was positioned in the

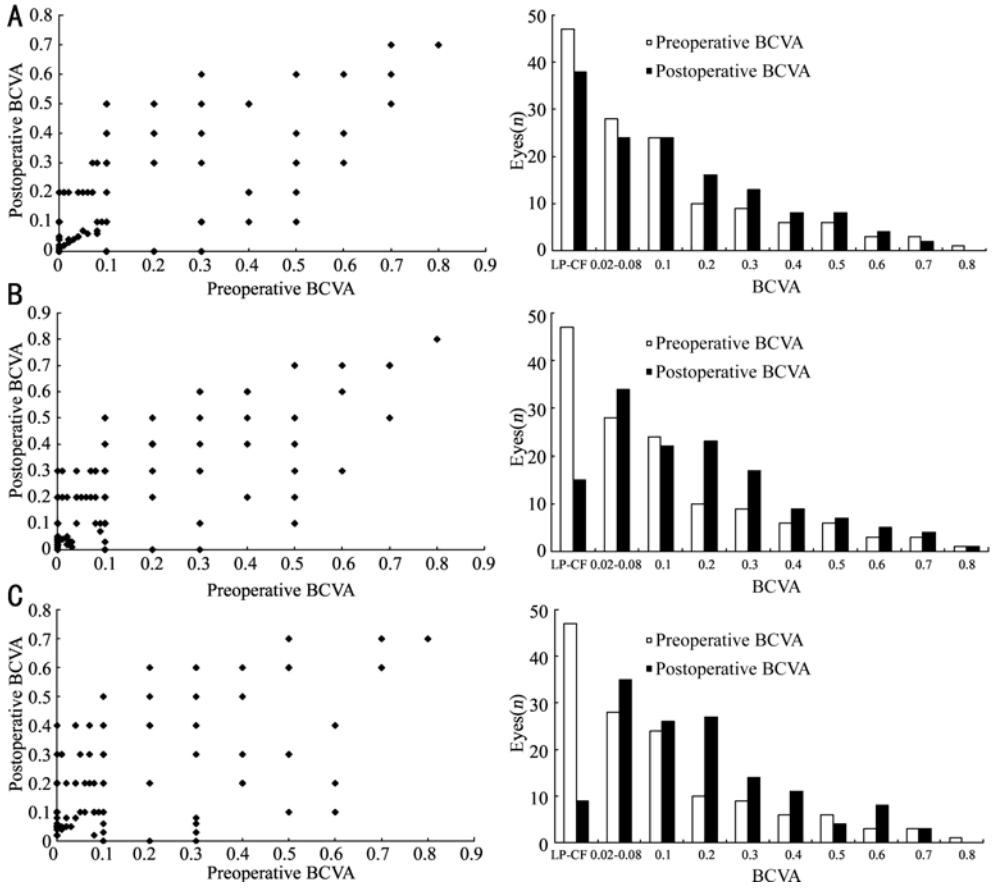

Figure 1 Preoperative *vs*postoperative BCVA A: 1 month; B: 6 months; C: 12 months.

capsular bag after the vitrectomy. Silicone oil was removed at the patient's convenience at least 6 months after the initial surgery, or earlier if IOP was not controlled under 21mmHg even using antiglaucomatous drops.

Outcome Measures The outcome measure was functional success, defined as improvement in visual acuity of two or more lines at the different follow-up time. Other key outcome measures were BCVA after anatomical successful surgery at the different follow-up time.

Statistical Analysis Statistical analysis was performed with SPSS software version 16. 0 (SPSS, Inc., Chicago, IL, USA). Qualitative variables were expressed using percentages, whereas quantitative data were defined using mean, standard deviation, confidence interval, or a combination thereof. The *t* test, Chi-square test, and Mann Whitney *U* test were used for inferential statistics. The level of significance was set at 0. 05.

RESULTS

Baseline Data We identified 137 eyes of 122 patients who met the study criteria. The mean age of the patients was 58. 9 (range 37 to 82) years. The mean follow-up was 12. 8 (range 3 to 18) months. The indications for combined surgery are listed in Table 1.

BCVA Mean BCVA initially worsened at 1 day, 1 week compared with baseline, but gradually improved through each of the remaining time points (Figure 1). At postoperative 1 month follow-up interval, 37 eyes (27.0%) gained two or more lines of vision compared with baseline while 29 eyes(21.2%) lost two or more lines. At postoperative 6 months follow-up interval, 55 eyes (40.1%) gained two or more lines of vision compared with baseline while 19 eyes (13.9%) lost two or more lines. At 12 months, 61 eyes (44.5%) gained two or more lines of vision compared with baseline, and 23 eyes (16.8%) lost two or more lines.

Table 1 Primary vitreoretinal indications for combined pars plana vitrectomy, phacoemulsification, and intraocular lens implantation

Indications	*n* (%)
Rhegmatogenous retinal detachment	29(21.2)
Tractional retinal detachment	26(19.0)
Proliferative diabetic retinopathy	27(19.8)
Macular hole	15(11.0)
Epiretinal membrane	12(8.8)
Terson's syndrome	5(3.7)
Proliferative vitreoretinopathy	11(8.0)
Myopic retinoschisis	7(5.1)
Coats disease	2(1.5)
Uveal effusion	3(2.2)

Complications There was not an increased incidence of complications related to combined PPV, phacoemulsification, and IOL implantation. There were no cases of endophthalmitis or suprachoroidal hemorrhage. Nine eyes (6. 6%) suffered retinal detachment(RD), of which six eyes had proliferative vitreoretinopathy from a prior RD. Six other eyes developed recognised intraoperative retinal tears that were treated without

progression to RD. Of the 14 eyes that received sulcus placement of the IOL, 8 eyes had capsular tears and 6 eyes had significant zonular weakness.

DISCUSSION

One of the most common sequela of PPV is cataract formation, especially in elder patients. Some complex vitreoretinal diseases such as diabetic retinopathy(DR) patients are more likely to have preoperative lens opacities, compared with other patients of the same age and often experience earlier lens opacities after vitrectomy if gas is used to repair the retina[5]. After vitrectomy, cataract may develop and may lead to reduction in vision[6]. In many cases, the cataract will eventually be removed after vitrectomy. However, in vitrectomized eyes, cataract extraction is difficult and increases the risk of posterior capsule rupture because a decrease in vitreous support causes fluctuations of anterior chamber depth, lens-zonule instability, and excessively mobile posterior capsule[7].

Making of the corneal incision is a very short, easy technique and does not increase the whole surgical time significantly, which is made in avascular tissue, no bleeding in the anterior chamber during the operation. The greater complexity of the procedure and the longer duration of the operation, the corneal endothelium would be at higher risk during a combined surgery. The viscoelastic material left in the anterior chamber during the whole posterior segment procedure may preserve the corneal endothelium and make it sufficiently clear during the whole operation to perform posterior segment surgery. Because of circular capsulorhexis and IOL implantation into the capsular bag, no cases of IOL developed decentration despite intraocular tamponade, which was performed in 123 eyes. For an excellent view of the retina was obtained during vitreoretinal surgery, the anterior chamber and capsular bag should be filled with viscoelastic material to stabilize the anterior chamber and posterior capsule. And the IOL implantation were performed after vitreoretinal surgery to prevent light reflexes from the IOL surface and prismatic effects caused by the IOL edge. When larger area of retina detaches, extreme care should be noted to avoid iatrogenic retinal damage. The posterior polar part of the lens needs to be cut off first before perfusion of some perfluorocarbon liquid and the incision is made toward the surrounding of the front. The incision is made forwardly alongside with the perfusion of perfluorocarbon liquid. Due to retinal ischemia, complete retinal detachment, or overturn, surrounding retina in grayish white color can mix within hemorrhage and organization, and thus, retina should be carefully distinguished from these, which should be completely removed. Otherwise, it can damage large area of retina. Superficial retinal retraction should also be removed as well. For patients with incarceration, abridgement of retina and severe PVR, incision of retina should be performed and the incision should be made in horizontal direction, as well as its surrounding. The reduction of retina is made by the followings: the perfusion of perfluorocarbon liquid and the exchange of gas and liquid. Under filling of perfluorocarbon liquid, retinal photocoagulation is performed, primarily at the surrounding of retinal fissure and at the edge of retina. The complicated retinal detachment usually requires filling of silicone oil in the cavity of lens, and approaches used are: the exchange of gas and silicone oil & the exchange of perfluorocarbon liquid and silicone oil. The exchange between perfluorocarbon liquid and silicone oil can prevent redetachment of retina during the surgery. The reduction of retina is the most difficult if it involves a larger fissure at the posterior part of retina. First, retina must be freed from retraction and the heavy water is directly used for the reduction of retina, which can allow the heavy water to enter below retina, making it difficult for operation and increasing time required. Also, the gas exchange can be performed first and then followed by perfusion of perfluorocarbon liquid after the reduction of retina when gas is filled within. Afterward, photocoagulation of retina is performed. Lastly, the eye is filled with silicone oil by the exchange of perfluorocarbon liquid and silicone oil. Patients with choroidal detachment need to be clear of subchoroidal hemorrhage, and the retinal process is the same as the procedures above, except the perfusion amount of silicone oil is slightly more. The characteristics of surgery for diabetic retinal lesions are as follows: (1) Preoperatively, pupil dilation is the least noticed and atropine & epinephrine mixture is administered below the episcleral layer of the surroundings of conjunctiva or cornea; (2) During the surgery, pupil restriction is greatly noticed due to stimulation to iris or low eye pressure. To avoid these, perfusion bottle should be elevated and iris incision should remain small; (3) Hemorrhage can occur during the surgery due to angiogenesis. Elevated perfusion bottle, flute-needle, underwater diathermy, and pressure by perfluorocarbon liquid can alleviate the problem; (4) Iatrogenic fissure is possibly due to the retinal detachment when there are retinal degeneration and tight binding between retina and organized chords. Thus, complete removal of any kinds of organized membrane adhesive to retinal surface can solve this problem. If retinal detachment is apparent, then the cutting, tearing, and peeling of membrane can be done during the perfusion of perfluorocarbon liquid. After the complete removal of organized membrane, the photocoagulation of entire retina, the exchange of gas and liquid, and the filling of lens cavity with inert gas are performed. If a patient has obvious retinal detachment, the filling should be done with silicone oil instead.

In summary, combined PPV, phacoemulsification, and IOL implantation is useful for the treatment of vitreoretinal diseases. The surgical results of combined surgery indicated that visual outcomes were generally desirable and complications were acceptable. We recommend combined vitreoretinal surgery and phacoemulsification with IOL implantation for patients having concomitant cataract and vitreoretinal abnormalities based on extensive experience with the combined procedure.

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玻璃体切除联合白内障手术治疗复杂性视网膜脱离

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摘要

目的:评价玻璃体切除联合白内障手术治疗复杂性视网膜脱离的疗效和安全性。

方法:回顾性病例系列研究。122 例 137 眼复杂性视网膜脱离患者接受玻璃体切除联合白内障手术治疗。主要结果包括术后视力和并发症。

结果:术后随访时间平均 12. 8mo。主要病因包括孔源性视网膜脱离,牵拉性视网膜脱离和增殖性糖尿病视网膜病变。术后 1,6 和 12mo 与术前比较视力提高大于等于 2 行分别为 37 眼(27. 0%)、55 眼(40. 1%)和 61 眼(44. 5%)。

结论:玻璃体切除联合白内障手术治疗复杂性视网膜脱离是一种有效、安全的手术。

关键词:联合手术;玻璃体切除术;超声乳化白内障吸除术;人工晶状体植入术;复杂性视网膜脱离