# Results of Combined Surgery by Phacoemulsification and Vitrectomy

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## Abstract

**Background:** Eyes scheduled for posterior segment surgery may have cataract, which obscures the visualization of the retina. Surgery may be carried out either by a two-step procedure: i.e., removal of the cataract followed later by posterior segment surgery; or it may be done in a single session: i.e., combined surgery of both the anterior and posterior segments.

**Objective:** To evaluate the outcomes of combined surgery by phacoemulsification and vitrectomy.

**Methods:** We retrospectively reviewed the records of 42 patients with coexisting cataract and vitreoretinal disease who underwent combined surgery by phacoemulsification and pars plana vitrectomy at one session.

**Results:** Indications for surgery were vitreous hemorrhage in 71.4%, retinal detachment in 11.9%, macular hole in 11.9%, and epiretinal membrane in 4.8%. There were no significant intraoperative complications.The main early postsurgical complications were fibrinous formation in 11.9%, elevated intraocular pressure in 23.8%, and recurrent vitreous hemorrhage in 9.5%. There were a few late complications related to phacoemulsification: posterior synechia in 9.5%, posterior capsular opacification in 7.1%, and dislocating intraocular lens in 4.8%. Recurrent retinal detachment occurred in five eyes and rubeoisis iridis in one. Visual acuity was improved in 85.8%, stable in 7.1% and worse in 7.1%.

**Conclusions:** Phacoemulsification performed at the time of posterior segment surgery enables good visualization during the vitrectomy, facilitates surgery, and is associated with only minor complications. In cases with cataract and vitreoretinal diseases, combined surgery by phacoemulsification and vitrectomy in one session may be considered.

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Cataract surgery may be combined with pars plana vitrectomy to improve visualization during posterior segment surgery in eyes with coexisting cataract and vitreoretinal disease [1]. The procedures to remove the cataract and repair posterior segment disease can be performed either as a sequential two-step procedure in subsequent sessions: namely, removal of the lens followed by posterior segment surgery; or, at one session: combined surgery of the cataract and vitreoretinal pathology. Senn et al. [2] reported the combined approach to be as safe and effective as the sequential approach.

There are two options for removing the lens in the combined surgery: lensectomy via the posterior approach [3,4] or cataract extraction via the anterior approach. The transition to small incision phacoemulsification as the procedure of choice for modern cataract surgery has led to its application in combined surgery as well [1,2,5,6].

This study aimed to evaluate the outcome of combined surgery by phacoemulsification with or without implantation of the posterior chamber intraocular lens and vitrectomy, carried out at one session in eyes with coexisting cataract and vitreoretinal disease.

## Materials and Methods

We retrospectively reviewed the records of patients whose eyes had undergone phacoemulsification with or without posterior chamber intraocular lens implantation and posterior segment surgery at one session during the period 1996–2001 and with at least 6 months follow-up

### Surgical technique

The steps for one-session combined phacoemulsification and pars plana vitrectomy included: insertion of preplaced 5-0 dacron suture for infusion, a 3.2 mm corneal incision at 12 o'clock, a standard phacoemulsification procedure with or without insertion of posterior chamber intraocular lens and, thereafter, a standard three-port pars plana vitrectomy.

The steps for combined phacoemulsificaton, retinal detachment repair and vitrectomy consisted of the following steps: peritomy, exposure and capture of four recti muscles, preplaced 5-0 dacron for vitrectomy infusion, a 3.2 mm corneal incision at 12 o'clock, phacoemulsification with or without insertion of posterior chamber intraocular lens, indirect fundoscopy for detection of retinal tear, cryopexy around the identified retinal tear, preplacement of scleral sutures for rubber and explant, insertion of the silicon rubber and the silicon implant without tightening the sutures, pars plana vitrectomy, endolaser, final fluid/air and air/silicon exchange (when indicated), tightening of sutures, and closure for buckle. In cases of concurrent macular pathology, additional surgical procedures, such as epiretinal membrane peeling, were performed during the stage of vitrectomy. In cases where posterior chamber IOL was not inserted during phacoemulsification, it was implanted at the end of vitrectomy before fluid/air exchange was performed.

The implanted IOL was the foldable acrylic type. An IOL was implanted in the bag. In two cases IOL implantation was not performed. Pupillar constrictors were not given to avoid dislocation of posterior chamber IOL. However, an air bubble was inserted into the anterior chamber. This air surface tension kept both the

IOL - intraocular lens

posterior chamber IOL in the bag and the pupil in a mid-dilated state.

During the postoperative period the patients were treated topically with antibiotic drops (phenimixine or garamycine) and dexamycin, six times daily for one week with eventual tapering during the first 6 week period. They were also given systemic oral antibiotic treatment (keflex, 1 g three times daily) for one week.

Data evaluated preoperatively included the patient's age, gender, systemic disease, visual acuity, cataract type and the underlying vitreoretinal disease. Visual acuity was evaluated by using the Snellen charts. Intraoperative complications and additional vitreoretinal procedures were also evaluated. Postoperative information included the best-corrected visual acuity, slit-lamp and fundal examination results, intra- and postoperative complications, medical treatment, and secondary intervention.

## Results

Forty-two eyes met the inclusion criteria. The demographic data of the patients are presented in Table 1. The more common indications for posterior segment surgery were vitreous hemorrhage, retinal detachment and macular hole [Table 2].

In all cases, curvilinear capsulaorrhexis was completed successfully, with no rupture of posterior capsule and uneventful phacoemulsification. There were no other intraoperative intraocular complications, such as intraocular hemorrhage or retinal tear. No case required posterior capsulotomy during surgery.

Following phacoemulsification a posterior chamber intraocular lens was implanted in 95.2% (40/42 eyes). In all cases where an implantation was performed, the posterior chamber IOL was implanted in the bag. In the remaining two eyes, complicated recurrent retinal detachment precluded insertion of a posterior chamber IOL.

In addition to phacoemulsificaion and vitrectomy, other posterior segment surgical procedures were also performed. Scleral buckling was placed in 9.5% (4/42 eyes). Injection of gas was performed in 21.4% (9/42 eyes) and injection of silicon in 7.1% (3/42 eyes).

We divided postoperative complications into two groups: early (1 month or less postsurgery) and late (more than 1 month after surgery) [Table 3]. One of the main early postsurgical anterior chamber complications was mild fibrinous reaction in 11.9% (5/42 eyes), which subsided after administration of topical steroids within 2 weeks after surgery. Intraocular pressure was elevated on the first postoperative day in 23.8% (10/42 eyes) (range 24–32 mmHg), but returned to nomal values following administration of antiglaucomatotic drugs within one week after surgery in 7 eyes. In an additional three patients intraocular pressure was normal on the first postoperative day but rose later and declined with subsequent antiglaucomatous treatment. One month following surgery only one eye remained with elevated intraocular pressure. One eye developed iris bombe 5 weeks after surgery. Peripheral YAG laser iridotomies were performed and intraocular pressure returned to normal values. The most frequent anterior segment late complications were posterior synechia in 9.5%, posterior capsular opacifications in 7.1%, and dislocation of posterior chamber IOL in 4.8%.

**Table 1.** Demographic characteristics

| Data | Patients (n=42) |
|---|---|
| Mean age (yrs) | 70.1 |
| Range | 53–89 |
| Male:Female | 15:27 (35.7:64.3) |
| Right eye:Left eye | 27:15 (64.3:35.7) |
| Systemic diseases (No. %) | |
| Diabetes mellitus | 29 (69.1) |
| Hypertension | 30 (71.4) |
| Cardiovascular | 7 (16.6) |
| Other | 8 (19.1) |

**Table 2.** Indications for posterior segment surgery (n = 42 eyes)

| Indications | No. (%) |
|---|---|
| Vitreous hemorrhage | 30 (71.4) |
| Vitreous hemorrhage, diabetic retinopathy | 20 (47.6) |
| Vitreous hemorrhage, retinal detachment | 4 (9.5) |
| Vitreous hemorrhage, AMD | 2 (4.8) |
| Vitreous hemorrhage, CRVO | 4 (9.5) |
| Retinal detachment | 5 (11.9) |
| Complicated | 4 (9.5) |
| Giant tear | 1 (2.4) |
| Macular hole | 5 (11.9) |
| Epiretinal membrane | 2 (4.8) |

AMD = age macular degeneration, CRVO = central retinal vein occlusion

**Table 3.** Surgical complications (n= 42 eyes)

| Complications | No. (%) |
|---|---|
| Early | |
| Fibrinous reaction | 5 (11.9) |
| Elevated intraocular pressure | 10 (23.8) |
| Vitreous hemorrhage | 4 (9.5) |
| Late | |
| Rubeosis iridis | 1 (2.4) |
| IOL dislocation | 2 (4.8) |
| Posterior synechia | 4 (9.5) |
| Posterior capsule opacification | 3 (7.1) |
| Glaucoma | 1 (2.4) |
| Epiretinal membrane | 1 (2.4) |
| Reccurent retinal detachment | 5 (11.9) |

YAG capsulotomy was not indicated in any of these eyes. Vitreous hemorrhage reccurred in 9.5% (4/42 eyes) and was absorbed spontaneously during the follow-up in all cases. One eye developed rubeoisis iridis which resolved following laser treatment.

Additional surgical interventions included laser photocoagulation in 11.9%, recurrent vitrectomy in 9.5%, scleral buckling in 7.1%, and pneumopexy in 7.1%. The initial phacoemulsification did not cause difficulties in the second intervention. Five patients developed recurrent retinal detachment, one of whom had a new unrelated traumatic injury with re-detachment. They all underwent additional interventions [Table 4], after which all eyes except one remained attached (97.6%). The one eye with reccurrent retinal detachment progressed to phthisis bulbi.

**Table 4.** Secondary surgical interventions (n= 5 eyes)

| Interventions | No. (%) |
|---|---|
| Pneumopexy | 3 (7.1) |
| Vitrectomy | 4 (9.5) |
| Scleral buckling | 3 (7.1) |
| Laser photocoagulation | 5 (11.9) |

Preoperative best-corrected visual acuity equal to or better than 20/60 was not observed in any of the eyes; 11.9% (5/42 eyes) had 20/80 to 20/100, and 88.1% (37/42 eyes) had 20/200 or worse. Visual acuity improved in 85.8% (36/42 eyes), was stable in 7.1% (3/42 eyes), and became worse in 7.1% (3/42 eyes). Postoperative visual acuity of ⩾ 20/60 was observed in 33.3% (14/42 eyes), 20/80 to 20/100 in 38.1% (16/42 eyes), and 20/200 or worse in 28.6% (12/42 eyes).

## Discussion

This study reports 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. However, other authors advocated additional reasons to perform the combined surgery even in the absence of a dense cataract. One reason is to obtain good visualization of the anterior retina, resulting in an easier approach to peripheral retina without the fear of damaging the lens, leading to safer working conditions for complete peripheral vitrectomy which may subsequently reduce post-operative complications [7]. A second reason is to facilitate postoperative treatments such as laser photocoagulation due to clear media. A third aim is to reduce the percentage of progressive cataract, which often complicates vitrectomy, and to enhance early postoperative visual recovery following insertion of posterior chamber IOL.

In our study the technique for removing the lens was phacoemulsification. As previously mentioned by Leyland and Schulenburg [1], phacoemulsification might be a superior technique, although there are no published data comparing the results of phacoemulsification and large incision extracapsular cataract extraction or lensectomy. Unlike lensectomy, which preserves anterior capsule, allows insertion of a sulcus-fixated IOL and is associated with high risk of rubeoisis iridis in diabetics [8], phacoemulsification is a small watertight incision that preserves the posterior capsule. The existence of the posterior capsule enables easy insertion of posterior chamber IOL "in the bag" and is thought to play a role in reducing rubeoisis iridis. Furthermore, lensectomy requires the use of fragmatome for hard lens with increased risk for retinal detachment [9,10].

The common indications for posterior segment surgery were vitreous hemorrhage, retinal detachment and macular hole, as described by others [1,7,11]. Following the phacoemulsification there were no posterior segment or intraoperative difficulties related to the phacoemulsification procedure [Table 2]. However, the timing of posterior chamber IOL implantation may vary. In most cases it is introduced at the end of phacoemulsification before performing vitrectomy to maintain vitreous support which facilitates the insertion of the posterior chamber IOL. Yet, in cases where clear visibility of the periphery is crucial, and the edges of the posterior chamber IOL may distort the view, the lens can be inserted at a later stage. However, it is recommended that the lens be implanted before performing fluid air exhange and intraocular tamponade to reduce the risk of anterior chamber shallowing and dislocation of the posterior chamber IOL.

The lens was well tolerated by the eyes, as observed by others [6,12]. In the present study the posterior chamber IOL was not implanted in two cases in which the indication for surgery was recurrent complicated retinal detachment and where silicon oil was used. Leyland and Schulenburg [1] did not implant intraocular lenses in cases of high myopia.

With regard to postoperative complications, the early complications were: elevated intraocular pressure in 23.8%, fibrinous formation in the anterior chamber in 11.9%, and recurrent vitreous hemorrhage in 9.5%. Similar results were obtained in a large study of 223 cases [13]: namely, significant postoperative inflammation in 7% and recurrent vitreous hemorrhage in 11%. Intraocular pressure decreased following topical antiglaucomatous treatment in all cases except one (2.4%). Fibrin was absorbed following topical use of topical steroids, although posterior synechia was observed in 4 eyes (9.5%) and dislocation of the posterior chamaber IOL in 2 eyes (4.8%). In summary, the postoperative complications related to the additional procedure of phacoemulsification were few and minor, as described by others [11,13,15].

Posterior segment surgery complications were similar to those following a single operation for vitreoretinal diseases. Vitreous hemorrhage occurred in the early postoperative period in four eyes and resolved spontaneously in three eyes, and additional drainage was indicated in one eye. The major complication was recurrent retinal detachment, which occurred in all cases that had been operated for retinal detachment. It should be mentioned that all of these cases were initially complicated by retinal detachment, which might explain the high rate of recurrency. Nonetheless, four of the five eyes with recurrrent retinal detachment remained attached following additional surgery.

Visual acuity of 20/60 or better was seen in only 33.3%. However, visual improvement of two lines in the Snellen chart was observed in 85.8%. Similar results (84.6%) in postoperative visual improvement were found by Chung et al. [15]. In the present study, the major cause of decreased visual acuity was maculopathy, particularly in cases of recurrent complicated retinal detachment and/or severe diabetic retinopathy.

Honjo and Ogura [6] reported improvement in postoperative visual acuity by two lines or more in 78% of operated eyes, while Demetriades et al. [11] reported postoperative visual improvement in 105 of 122 patients. The latter two series most probably included eyes with less severe initial maculopathy.

Our study was limited by its retrospective nature. Nevertheless, our results support findings of other similar studies (1,11,12,15) and show that combined surgery by phacoemulsification with posterior chamber IOL and virectomy can be considered in treating patients with cataract and posterior segment pathology. Combined surgery

enables better visualization for the surgeon, reduces the need for a second operation, and allows early postoperative visual rehabilitation for the patient.

## References


1. Leyland MD, Schulenburg WE. Combined phacoemulsification-vitrectomy surgery: technique, indications and outcomes. *Eye* 1999;13:348–52.
2. Senn P, Schipper I, Perren B. Combined pars plana vitrectomy, phacoemulsification in the capsular bag: a comparison to vitrectomy and subsequent cataract surgery as a two-step procedure. *Ophthalmic Surg Lasers* 1995;26:420–8.
3. Benson WE, Blankenship GW, Machemer R. Pars plana lens removal with vitrectomy. *Am J Ophthalmol* 1977;84:150–2.
4. Ryan EH, Gilbert HD. Lensectomy, vitrectomy indications and techniques in cataract surgery. *Curr Opin Ophthalmol* 1996;7:69–74.
5. Koenig SB, Mieler WF, Han DP, Abrams GW. Combined phacoemulsification, pars plana vitrectomy and posterior chamber intraocular lens insertion. *Arch Ophthalmol* 1992;110:1101–4.
6. Honjo M, Ogura Y. Surgical results of pars plana vitrectomy combined with phacoemulsification and intraocular lens implantation for complications of proliferative diabetic retinopathy. *Ophthalmic Surg Lasers* 1998;29:99–105.
7. Suzuki Y, Sakuraba T, Mizutani H, Matsuhashi H, Nakazawa M. Postoperative complications after simultaneous vitrectomy and cataract surgery. *Ophthalmic Surg Lasers* 2001;32:391–6.
8. Poliner LS, Christianson DJ, Escoffery RF, Kolker AE, Gordon ME. Neovascular glaucoma after intracapsular and extracapsular cataract extraction in diabetic patients. *Am J Ophthalmol* 1985;100:637–43.
9. Fastenberg DM, Schwartz PL, Shakin JL, Golub BM. Management of dislocated nuclear fragments after phacoemulsification. *Am J Ophthalmol* 1991;112:535–9.
10. Borne MJ, Tasman W, Regillo C, Malcha M. Sarin L. Outcomes of vitrectomy for retained lens fragments. *Ophthalmology* 1966;103:971–6.
11. Demetriades AM, Gottsch JD, Thomsen R, et al. Combined phacoemulsification, intraocular lens implantation, and vitrectomy for eyes with coexisting cataract and vitreoretinal pathology. *Am J Ophthalmol* 2003;135(3):291–6.
12. Scharwey K, Pavlovic S, Jacobi KW. Combined clear corneal phacoemulsification, vitreoretinal surgery, and intraocular lens implantation. *J Cataract Refract Surg* 2000;26(2):161–2.
13. Lahey MJ, Francis RR, Kearney JJ. Combining phacoemulsification with pars plana vitrectomy in patients with proliferative diabetic retinopathy. A series of 223 cases. *Ophthalmology* 2003;110:1335–9.
14. Kadonosono K, Matsumoro S, Uchio E, Sugita M, Akura J, Ohno S. Iris neovascularization after vitrectomy combined with phacoemulsification and intraocular lens implantation for proliferative diabetic retinopathy. *Ophthalmic Surg Lasers* 2001;32:19–24.
15. Chung TY, Chung H, Lee JH. Combined surgery and sequential surgery comprising phacoemulsification, pars plana vitrectomy, and intraocular lens implantation: comparison of clinical outcomes. *J Cataract Refract Surg* 2002;28:2001–5.



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