Clinical & Experimental Ophthalmology

Ates et al., J Clin Exp Ophthalmol 2015, 6:4
http://dx.doi.org/10.4172/2155-9570.1000455

Research Article Open Access

Combined Vitrectomy and Clear Corneal Phacoemulsification in Patients with Vitreoretinal Diseases

Orhan Ateş*, İbrahim Koçer, Can Lokman Pınar, Sadullah Keleş, Orhan Baykal, Elif Topdağı, Kenan Yıldırım

Department of Ophthalmology, Medical Faculty, Ataturk University, Erzurum, Turkey

***Corresponding author:** Orhan Ateş, Atatürk University, Faculty of Medicine, Department of Ophthalmology, 25270, Erzurum, Turkey; Tel: +90.442.2317119, E-mail: orhanates69@hotmail.com

Received date: May 25, 2015, **Accepted date:** July 28, 2015, **Published date:** Aug 01, 2015

Abstract

Background: The aim of the study was to examines the results, intraoperative and postoperative complications, and visual outcomes of combined phacoemulsification and pars plana vitrectomy (PPV) under sub-Tenon's anesthesia.

Methods: This retrospective study included 56 eyes of 56 patients who underwent combined vitrectomy and clear corneal cataract surgery for posterior segment disease. All patients had applied randomly. A 50:50 mixture of 2% lidocaine and 0.75% bupivacaine was applied for sub-Tenon's anesthesia followed by a standard phacoemulsification-IOL procedure and three-port vitrectomy. Visual outcomes and surgical complications of patients were measured the during the mean 9 months after surgery.

Results: Preoperatively, indications for 12 (21%) of the patients were retinal detachment, 25 (45%) were diabetic intravitreal haemorrhage, and 19 (34%) were intravitreal haemorrhage related to retinal vein occlusion for combined surgery. None of the cases in this study experienced intraoperative capsule rupture, but two cases had iatrogenic retinal tearing. In the first postoperative visit, none of the patients exhibited hypotony, corneal oedema was observed in five patients and four patients had elevated intraocular pressure (IOP). None of the patients who received the perfluoropropane gas injection had elevated IOP. Eleven patients had the same visual acuity and 45 patients had improved visual acuity at the end of the follow-up period. Postoperatively, four cases developed 160–180° posterior synechiae due to inflammation, and one case developed 360° posterior synechiae and elevated intraocular pressure. Posterior capsule opacification developed in three cases, and none of the patients experienced IOL decentralization.

Conclusion: Combined surgery, 23-gauge vitrectomy and clear corneal phacoemulsification, under sub-Tenon's anesthesia was safe and effective in patients with posterior segment disease.

Keywords Cataract; Retina

Introduction

Pars plana vitrectomy (PPV) has been used for many years to treat posterior segment disorders and diseases such as vitreal haemorrhage, vitreous opacities, epiretinal membrane, diabetic retinopathy, and retinal detachment [1,2]. With advanced vitrectomy techniques, it is possible to achieve good anatomical and visual outcomes [3]. The 23-G transconjunctival vitrectomy technique developed by Claus Eckardt is one such method adopted by contemporary vitreoretinal surgeons [3,4]. Cataracts often co-occur with vitreoretinal pathology, leading to worse surgical outcomes and impaired visibility of the posterior segment during vitreoretinal surgery [5]. If surgical interventions for vitreoretinal disease and cataracts are done sequentially, the presence of a cataract places the patient at risk of vision loss, despite a successful vitreoretinal procedure [6,7]. However, conducting two separate surgeries instead of one combined procedure increases the likelihood of delayed healing and low vision [8].

Cataracts increase in prevalence with age may time it accompanies vitreoretinal pathologies such as diabetic retinopathy macular holes, epiretinal membranes. In addition, cataract occuries after vitrectomy [9].

Using advanced surgical techniques to combine cataract and vitreoretinal procedures has maken progress in recent years [10,11]. Combined surgery allows for better posterior segment visibility, better clearing of the vitreous base, and faster vision recovery. It also eliminates the need for another operation to remove cataracts from vitrectomized eyes [12,13]. Furthermore, phacoemulsification is technically more difficult to perform in vitrectomized eyes because of the lack of vitreous support. Several reports on cataract removal and PPV as a combined procedure can be found in the literature [14].

In additional, surgical techniques, clear corneal phacoemulsification combined with small-gauge sutureless vitrectomy has been increasingly used for complex vitreoretinal pathologies. Simultaneous combined surgical techniques has been shown to be effective and safe in vitreoretinal diseases [14].

In this retrospective study, we recorded intraoperative and postoperative complications and visual outcomes of patients who had combined pars plana vitrectomy (PPV) phacoemulsification and under sub-Tenon's anesthesia.

Materials and Methods

This retrospective study was confirmed by Ataturk University Research Ethics Committee and adhered to the principle of the Declaration of Helsinki. Informed consent was obtained from all patients. Medical archives of patients who had combined PPV and cataract surgery between the dates of January 2012 and July 2014 were measured. 56 eyes from 56 patients who underwent combined PPV and phacoemulsification-IOL procedure were analysed.

In the preoperative and postoperative periods, all patients underwent complete ophthalmic examinations consisting of visual acuity assessment, slit-lamp microscopy, intraocular pressure (IOP) measurement, and anterior and posterior segment ophthalmoscopy. In cases of poor fundus visibility, the posterior segment was assessed by ultrasonography. Intraocular lens strength was calculated using the SRK II formula. If fundus pathology prevented proper measurement, the other eye was used to calculate the intraocular lens strength

All patients received 5 mg diazepam IM. Four drops of topical 0.5% proparacaine hydrochloride (Alcaine, USA) solution were applied before the surgery to the cornea and conjunctiva. A 50:50 mixture of 2% lidocaine and 0.75% bupivacaine solutions were administered for sub-Tenon's anesthesia. The ocular surface was washed with 5% povidone-iodine solution and irrigated with BSS after one minute. The preoperative period ($p<0.001$as injected into the inferonasal quadrant and sub-Tenon's space by 2.5 cm curved blunt needle. A clear corneal incision was made with consideration of the astigmatism axis, followed by 5-5.5 mm capsulorhexis, phacoemulsification and irrigation/aspiration. A foldable hydrophobic acrylic lens was then implanted in the capsular bag. To prevent elevated postoperative IOP, viscoelastic material was removed from the anterior chamber. After suturing the incision site with 10/0 nylon, a standard three-port 23-G vitrectomy was conducted. The vitreous was cleared and, if necessary, additional vitreoretinal procedures such as air-liquid/air-gas adjustments and endophotocoagulation were performed. . Patients were examined at postoperative day 1, day 7, day 14, and every month thereafter.

We recorded the following data: preoperative and postoperative visual acuity and Intraoperative and postoperative complications such as iatrogenic retinal breaks, retinal detachments or vitreous haemorrhages were evaluated. Statistical analyses were performed using SPSS for Windows (version 11.5; SPSS Inc., Chicago, Illinois, USA). Statistical significance was calculated using one-way ANOVA.

Results

Of these patients, 25 (45%) were men and 31 (55%) were women; the age range of the patients was 55-65 years. None of the patients had undergone previous vitrectomy. Preoperatively, 12 (21%) of the patients had retinal detachment, 25 (45%) had diabetic intravitreal haemorrhage and 19 (34%) had intravitreal haemorrhage related to retinal vein occlusion (Table 1).

All patients had lens opacities that were sufficient to cause vision disruption and impaired visibility during vitrectomy. Patients in this study underwent routine cataract surgery with clear corneal tunnel incision and hydrophobic acrylic IOL implantation in the bag. The mean duration of the patients' follow-up periods was 9 (range: 6-12) months. None of the patients experienced posterior capsule perforation during the phaco procedure, and five patients developed corneal oedema during the PPV stage of the procedure. Intraoperative iatrogenic retinal tears occurred in two patients; however, the tears were controlled by argon laser photocoagulation. Tamponade was performed with silicone oil in seven eyes and perfluoropropane gas in five eyes. The silicone was removed at least 12 weeks later. On the first postoperative day, none of the patients exhibited hypotony. Corneal oedema was observed in five patients in postoperative period. In four patients who received heavy silicone injections, elevated IOP developed during the follow-up period. This was controlled with topical treatment. Elevated IOP was not detected in any patients who received the perfluoropropane gas injection.

Indication	Eyes (n)	%
Rhegrnatogenous retinal detachment	5	9
Traction retinal detachment	7	12
Intravitreal hemorrhage to diabetic retinopathy	19	34
Intravitreal hemorrhage related to retinal vein occlusion	25	45
Total	56	100

Table 1: Indications for surgery.

In relation to their preoperative best corrected visual acuity (BCVA), 11 patients had the same visual acuity and 45 patients had improved visual acuity at the end of the follow-up period. There was a statistically significant improvement in average visual acuity in the postoperative period compared to the preoperative period ($p<0.001$). Postoperatively, 4 cases developed 160-180° posterior synechiae due to inflammation, and 1 case developed 360° posterior synechiae and elevated IOP. None of the patients experienced IOL decentralization. Postoperative complications included posterior capsule opacification (PCO) in 8 eyes, which was treated with YAG laser. Silicone oil tamponade was removed from the 7 eyes at the end of the follow-up period. After silicon oil removal, no retinal detachment recurred in any eye. In 3 eyes re-detachment was observed at the 4 week follow-up and these patients underwent repeat surgery. 3 eyes had reoperation for vitreous haemorrhage at 3 months follow-up after surgery (Table 2).

	Eyes (n)	%
Intraoperative capsule rupture	0	0
Iatrogenic retinal breaks	2	4
Hypotony	0	0
Elevated intraocular pressure	4	7
Corneal oedema	5	9
160–180° posterior synechiae	4	7
360° posterior synechiae	1	2
Posterior capsule opacification	8	14
IOL decentralization	0	0
Reoperation for Retinal detachment	3	5
Reoperation for Vitreous hemorrhage	2	4

Table 2: Intraoperative and postoperative complications.

Discussion

PPV was first implemented in 1971. Since then, it has been further developed with additional surgical procedures. Today, PPV is a frequently used surgical intervention for the treatment of retinal diseases [15,16]. In recent years, combined surgery has gained popularity among retina specialists for cases with both cataract and vitreoretinal disease [17,18]. In addition, the use of clear corneal phacoemulsification and small entry sutureless vitrectomy has increased in complicated posterior segment disease. Combined phacoemulsification and sutureless 23-G vitrectomy has been shown to be safe and effective [19].

Recently, patients undergoing PPV could have cataract extraction performed in the same surgical session. However, some studies recommended placing the intraocular lens immediately after cataract extraction, before performing PPV and other additional surgical procedures. Other authors argued that globe manipulation after cataract extraction could cause complications, such as leakage from the corneal incision site, meiosis, or loss of corneal transparency due to Descemet's membrane folds. These authors recommended that the IOL should be implanted in a separate surgical session after the posterior segment surgery has been performed [14,20,21].

Small-incision phacoemulsification method lowers the risk of corneal wound leakage, allows easier globe manipulation, and minimizes Descemet's membrane folds. This method of phacoemulsification causes minimal trauma, preventing the development of meiosis and allowing for better visualization of the retina [21-23]. Use of small incision phacoemulsification in a combined procedure allows for easier evaluation of the retinal periphery and results in a more comfortable operation. The most important point in this procedure is placing the IOL. Some surgeons recommend IOL implantation after vitrectomy to prevent leakage from the incision and problems viewing the peripheral retina due to lens-related refraction [24,25]. Furthermore, IOL implantation before vitrectomy prevents posterior capsule swelling, which stabilizes the iris capsule diaphragm and allows for stretching of the posterior capsule and better visibility of the retina during vitrectomy. In our study, acrylic foldable IOL implantation was performed prior to vitrectomy in all cases.

Jalil et al. implanted the IOL immediately after lensectomy in all patients and stated that the IOL and the lens capsule did not cause any problems viewing the fundus or applying laser treatment during posterior segment surgery. They also claimed that having an IOL implanted provided the added advantage of distending the posterior capsule, which prevented incidental capsule trauma [26]. Similar studies showed that clear corneal incision with phacoemulsification was safe and provided rapid visual rehabilitation in the majority of cases when combined with PPV. As the corneal incision is done in the avascular cornea, it does not lead to anterior chamber haemorrhage and postoperative inflammation is minimal. Most notably, viewing the peripheral retina is possible. In addition, as reported in the literature, the corneal incision is resistant to elevated IOP and globe manipulation [27,28].

Demetriades et al. published a study of a combined vitrectomy and cataract procedure. After phacoemulsification and IOL implantation, vitrectomy was performed in patients with diabetic vitreal haemorrhage, macular hole, epiretinal membrane, and retinal detachment. The authors concluded that combined IOL implantation and posterior capsulorhexis procedure was advantageous because it lessened the number of surgical sessions per patient and resulted in earlier visual rehabilitation [28]. Combined surgery has been recommended in other recent studies due to its advantages, including better visibility of the posterior chamber, the ability to reach the anterior vitreous, no risk of damaging the lens, and completing necessary interventions in one surgical session. Furthermore, Savasatano et al. compared postoperative complications in patients who underwent 25-G high-speed vitrectomy versus combined vitrectomy and phacoemulsification, and found that the combined procedure did not increase the rate of postoperative complications [28,29]. The results of this study indicate that combined surgery is an appropriate treatment option for patients with both posterior segment pathology and cataracts. In addition to positive PPV outcomes and acceptable complication rates, this method provides several advantages, including better visibility during surgery, decreased risk associated with a second surgical session, lower cost, and earlier postoperative visual recovery.

Studies have shown that sub-Tenon's anesthesia was comfortable and reliable for ophthalmic surgery patients. The effect of this method continues longer and it provides deeper anaesthesia. This method of anaesthesia can provide better pupillary dilatation, which is an advantage for the surgeon [30,31].

Foster and all showed result of combined technique cataract extraction was followed by vitrectomy. They reported complications, one eye neovascular glaucoma, one pupillary block and two posterior synechiae in study. They concluded that the combined technique provided clear anterior and posterior segment media [32]. In a more recent study the authors evaluated the visual outcomes and complications of combined surgical for the complications of proliferative diabetic retinopathy. All patients underwent combined sutureless vitrectomy and clear corneal cataract surgery. Indications of their surgery were vitreous hemorrhage and tractional retinal detachment. At result, visual acuity improved from 0.86 ± 0.59 preoperatively to 0.39 ± 0.52 six months postoperatively ($P<0.0001$). 7 eyes had intraoperative retinal tear, in 10 eyes had postoperative vitreous haemorrhage, 1 eye had postoperative hypotony, 1 eye developed neovascular glaucoma and 6 eyes required a repeat vitrectomy. They conclusied that combined for the complications of proliferative diabetic retinopathy was safe and effective [33]. Similarly in a retrospective study included the measures pre and postoperative visual acuity, operating time, intraocular pressure, intra- and postoperative complications for epiretinal membrane, refractory macular oedema associated with retinal vascular disorders, idiopathic macular hole, non-clearing vitreous haemorrhage, rhegmatogenous retinal detachment, tractional retinal detachment associated with proliferative diabetic retinopathy, and subretinal haemorrhage underwent combined surgery. Final visual acuity impaired as statistically significant in combined surgery group. They reported no intraoperative complications. However 18 eyes had hypotony during the first week after surgery. One case of retinal detachment was observed throughout the follow-up period combined surgery group [34].

In addition it Sood and all measured hypotony rates, logMAR visual acuity, and intraocular inflammation in vitrectomy combined with phacoemulsification and IOL implantation. Results of their study indicate that combined surgery is an advantage option for visual outcomes, led to faster visual rehabilitation, and reduced ocular inflammation in vitreoretinal diseases [35].

The intraoperative and postoperative complications rate our study is similar to the literature. We supported that a combined surgery of pars plana vitrectomy and phacoemulsification undergoing sub-Tenon's anaesthesia is safe and effective in patients have vitreoretinal diseases. Considering the advantages of the combined procedure, we believe that combined surgery was effectively and safely used without increased rates of complications on eligible vitreoretinal diseases.

Acknowledgments

We have no financial or material support for this manuscript. There were no conflicts of interest between authors in this manuscript.

References

1. Stalmans P (2014) 23-gauge vitrectomy. Dev Ophthalmol 54: 38-44.
2. Czajka MP, Frajdenberg A, Johansson B (2014) Outcomes after combined 1.8-MM microincision cataract surgery and 23-gauge transconjunctival vitrectomy for posterior segment disease: a retrospective study. Retina 34: 142-148.
3. Eckardt C (2012) A 23-gauge dual light probe for vitreoretinal surgery. Retina 32: 1685-1686.
4. Celiker H, Karabas L, Sahin O (2014) A comparison of topical or retrobulbar anesthesia for 23-gauge posterior vitrectomy. J Ophthalmol 2014: 237028.
5. Feng H, Adelman RA (2014) Cataract formation following vitreoretinal procedures. Clin Ophthalmol 8: 1957-1965.
6. Jalil A, Steeples L, Subramani S, Bindra MS, Dhawahir-Scala F, et al. (2014) Microincision cataract surgery combined with vitrectomy: a case series. Eye (Lond) 28: 386-389.
7. Czajka MP, Frajdenberg A, Johansson B (2014) Outcomes after combined 1.8-MM microincision cataract surgery and 23-gauge transconjunctival vitrectomy for posterior segment disease: a retrospective study. Retina 34: 142-148.
8. Wensheng L, Wu R, Wang X, Xu M, Sun G, et al. (2009) Clinical complications of combined phacoemulsification and vitrectomy for eyes with coexisting cataract and vitreoretinal diseases. Eur J Ophthalmol 19: 37-45.
9. Treumer F, Bunse A, Rudolf M, Roider J (2006) Pars planavitrectomy, phacoemulsification and intraocular lens implantation. Comparison of clinical complications in a combined versus two-step surgical approach. Graefes Arch ClinExp Ophthalmol 244: 808-815.
10. Kim SH, Chung JW, Chung H, Yu HG (2004) Phacoemulsification and foldable intraocular lens implantation combined with vitrectomy and silicone oil tamponade for severe proliferative diabetic retinopathy. J Cataract Refract Surg 30: 1721-1726.
11. Pollack A, Landa G, Kleinman G, Katz H, Hauzer D, et al. (2004) Results of combined surgery by phacoemulsification and vitrectomy. Isr Med Assoc J 6: 143-146.
12. Sisk RA, Murray TG (2010) Combined phacoemulsification and sutureless 23-gauge pars plana vitrectomy for complex vitreoretinal diseases. Br J Ophthalmol 94: 1028-1032.
13. Lahey JM, Francis RR, Kearney JJ (2003) Combining phacoemulsification with pars plana vitrectomy in patients with proliferative diabetic retinopathy: a series of 223 cases. Ophthalmology 110: 1335-1339.
14. Chen WQ, Jhanji V, Chen HY, Zhang GH, Hou P (2014) Visual impact of sub-Tenon anesthesia during combined phacoemulsification and vitrectomy surgery. Int J Ophthalmol 7: 860-863.
15. Gerding H, Hersener A (2013) Anatomical and functional results of primary pars plana vitrectomy in rhegmatogenous retinal detachment. Klin Monbl Augenheilkd 230: 409-412.
16. Schwartz SG, Flynn HW Jr, Mieler WF (2013) Update on retinal detachment surgery. Curr Opin Ophthalmol 24: 255-261.
17. Aizawa N, Kunikata H, Abe T, Nakazawa T (2012) Efficacy of combined 25-gauge microincision vitrectomy, intraocular lens implantation, and posterior capsulotomy. J Cataract Refract Surg 38: 1602-1607.
18. Mochizuki Y, Kubota T, Hata Y, Miyazaki M, Suyama Y, et al. (2006) Surgical results of combined pars plana vitrectomy, phacoemulsification, and intraocular lens implantation. Eur J Ophthalmol 16: 279-286.
19. Wensheng L, Wu R, Wang X, Xu M, Sun G, et al. (2009) Clinical complications of combined phacoemulsification and vitrectomy for eyes with coexisting cataract and vitreoretinal diseases. Eur J Ophthalmol 19: 37-45.
20. Park DH, Shin JP, Kim SY (2011) Combined 23-gauge microincisonal vitrectomy surgery and phacoemulsification with AcrySof toric intraocular lens implantation: a comparative study. Eye (Lond) 25: 1327-1332.
21. Lee JY, Kim KH, Shin KH, Han DH, Lee DY, et al. (2012) Comparison of intraoperative complications of phacoemulsification between sequential and combined procedures of pars plana vitrectomy and cataract surgery. Retina 32: 2026-2033.
22. Dada T, Mandal S, Aggarwal A, Gadia R (2007) Microincision cataract surgery in a vitrectomized eye. J Cataract Refract Surg 33: 577-579.
23. Romero P, Salvat M, Almena M, Baget M, Méndez I (2006) [Combined surgery for lens extraction, vitrectomy, and implantation in the diabetic patient using phacoemulsification versus phacofragmentation]. J Fr Ophtalmol 29: 533-541.
24. Silva PS, Diala PA, Hamam RN, Arrigg PG, Shah ST, et al. (2014) Visual outcomes from pars plana vitrectomy versus combined pars plana vitrectomy, phacoemulsification, and intraocular lens implantation in patients with diabetes. Retina 34: 1960-1968.
25. Pålsson S, Nyström A, Sjödell L, Jakobsson G, Byhr E, et al. (2015) Combined phacoemulsification, primary intraocular lens implantation, and pars plana vitrectomy in children with uveitis. Ocul Immunol Inflamm 23: 144-151.
26. Jalil A, Steeples L, Subramani S, Bindra MS, Dhawahir-Scala F, et al. (2014) Microincision cataract surgery combined with vitrectomy: a case series. Eye (Lond) 28: 386-389.
27. Savastano A, Savastano MC, Barca F, Petrarchini F, Mariotti C, et al. (2014) Combining cataract surgery with 25-gauge high-speed pars plana vitrectomy: results from a retrospective study. Ophthalmology 121: 299-304.
28. Demetriades AM, Gottsch JD, Thomsen R, Azab A, Stark WJ, et al. (2003) Combined phacoemulsification, intraocular lens implantation, and vitrectomy for eyes with coexisting cataract and vitreoretinal pathology. Am J Ophthalmol 135: 291-296.
29. Savastano A, Savastano MC, Barca F, Petrarchini F, Mariotti C, et al. (2014) Combining cataract surgery with 25-gauge high-speed pars plana vitrectomy: results from a retrospective study. Ophthalmology 121: 299-304.
30. Villafranca Barba A, Mouslim S, De la Gala García FA, Reyes Fierro A (2011) [Sub-tenon block for ocular globe anesthesia: a review]. Rev Esp Anestesiol Reanim 58: 167-173.
31. Roman SJ, Chong Sit DA, Boureau CM, Auclin FX, Ullern MM (1997) Sub-Tenon's anaesthesia: an efficient and safe technique. Br J Ophthalmol 81: 673-676.
32. Foster RE, Lowder CY, Meisler DM, Zakov ZN, Meyers SM, et al. (1993) Combined extracapsular cataract extraction, posterior chamber intraocular lens implantation, and pars plana vitrectomy. Ophthalmic Surg 24: 446-452.
33. Lee DY, Jeong HS, Sohn HJ, Nam DH (2011) Combined 23-gauge sutureless vitrectomy and clear corneal phacoemulsification in patients with proliferative diabetic retinopathy. Retina 31: 1753-1758.
34. Oshima Y, Ohji M, Tano Y (2006) Surgical outcomes of 25-gauge transconjunctival vitrectomy combined with cataract surgery for vitreoretinal diseases. Ann Acad Med Singapore 35: 175-180.
35. Sood V, Rahman R, Denniston AK (2009) Phacoemulsification and foldable intraocular lens implantation combined with 23-gauge

transconjunctival sutureless vitrectomy. J Cataract Refract Surg 35: 1380-1384.