

Outcome and Complications of Phacoemulsification Combined with Pars Plana Vitrectomy

Irfan Ullah Shah^{1*}, Asif Manzoor², Muhammad Naeem³, Ayyaz Hussain Awan⁴, Muhammad Zia Iqbal⁵, Safeet Shahbaz Khan⁶, Bilal Khan⁷

¹Assistant Professor, Department of Ophthalmology, KIMS, Kohat, Pakistan

²Assistant Professor, Department of Ophthalmology, Bakhtawar Amin College, Multan, Pakistan

³Assistant Professor, Department of Ophthalmology, Lady Reading Hospital, Peshawar, Pakistan

⁴Associate Professor Ophthalmology, Farooq Hospital and Akhtar Saeed Medical College, Rawalpindi, Pakistan

⁵Professor of Anatomy, Department of Basic Medical Sciences, Sulaiman Alrajhi University, Albukaryiah, Saudi Arabia

⁶Assistant Professor of Ophthalmology, Bakhtawar Amin Hospital, Multan, Pakistan

⁷Assistant Professor MTI/ Khyber Medical College/Khyber Teaching Hospital, Peshawar, Pakistan

*Corresponding author:

Asna Tahir,

Email: dr.asnatahir06@gmail.com

Cite this paper as: Irfan Ullah Shah, Asif Manzoor, Muhammad Naeem, Ayyaz Hussain Awan, Muhammad Zia Iqbal, Safeet Shahbaz Khan, Bilal Khan, (2025) Outcome and Complications of Phacoemulsification Combined with Pars Plana Vitrectomy. *Journal of Neonatal Surgery*, 14 (32s), 6000-6004.

ABSTRACT

Background: Phacoemulsification combined with pars plana vitrectomy is a widely used surgical technique for managing coexisting anterior and posterior segment pathologies. However, the procedure can lead to significant intraoperative and postoperative complications that impact clinical outcomes.

Objective: To evaluate the outcomes and complications associated with phacoemulsification combined with pars plana vitrectomy.

Material and Methods: This prospective observational study was conducted at the **Department of Ophthalmology, Bakhtawar Amin College, Multan**, over a period of six months from January 2024 to June 2024. A total of 196 patients underwent phacoemulsification combined with pars plana vitrectomy. The mean age of the patients was 47.93 years (SD \pm 12.381). Intraocular pressure (IOP) was measured preoperatively, at 1 month, and at 12 months postoperatively. Intraoperative and postoperative complications were documented, and statistical analyses were performed to assess differences in IOP and complications.

Results: The mean preoperative IOP was 14.65 mmHg (SD \pm 3.693). Postoperatively, the mean IOP increased to 16.80 mmHg at 1 month and slightly decreased to 16.31 mmHg at 12 months, with statistically significant differences at both time points ($p = 0.000$ and $p = 0.002$, respectively). Most intraoperative complications were mild, with the lens capsule remaining intact in the majority of cases. Scleral sutures were frequently required, and postoperative complications included mild anterior segment reaction and fibrin presence. While complications were largely manageable, specific findings necessitate careful surgical technique and diligent postoperative care.

Conclusion: Phacoemulsification combined with pars plana vitrectomy is a safe and effective procedure. However, the need for close monitoring of IOP and management of certain complications is essential to optimize outcomes

Keywords: Phacoemulsification, Pars plana vitrectomy, Intraocular pressure, Surgical outcomes, Complications

1. INTRODUCTION

Modern management of coexistent cataracts and vitreoretinal diseases is basically phacoemulsification with pars plana vitrectomy (PPV), commonly called phacovitrectomy. This dual procedure takes advantage of a single surgical session to fix both conditions as one ends up going through less discomfort, fewer hospital visits and minimal recovery time afterwards. With the increasing prevalence of cataracts and vitreoretinal pathologies, especially in the aging population and with the systemic disease such as diabetes, phacovitrectomy has become an increasingly popular surgical route [1,2]. On account of its potential for improving visual outcomes and reducing the surgical burden of sequential procedures, it has become an established part of modern ophthalmic practice.

Vitreoretinal diseases have a challenging cataract problem either age related or following vitreoretinal surgery. While effective, sequential surgeries may be associated with delayed visual rehabilitation and higher rates of complication secondary to anatomic and physiologic alterations of the vitrectomized eye [3]. These challenges can be overcome, recovery hastened, and optimum visual outcomes achieved by performing simultaneous phacoemulsification and PPV [4]. Advances over the past few years in surgical techniques including smaller gauge vitrectomy systems and new intraocular lens technologies have improved the safety and efficacy of phacovitrectomy [5].

Phacovitrectomy has been shown in clinical studies to have significant benefits in that visual acuity is markedly improved in patients with a wide variety of diseases. For instance, in diabetic vitreous hemorrhage, vision can be improved in over 90% of cases with minimal complication profile [6] if combined surgery is performed. In macular hole or epiretinal membrane, phacovitrectomy not only does this anatomically but also lowers the rate of subsequent cataract surgery [7], thereby facilitating this rehabilitation. Like all surgical intervention, however, phacovitrectomy is not without risk. The intraoperative complications that are commonly experienced include miosis, posterior capsular rupture, and problems with capsular stability [8]. However, postoperatively cystoid macular edema, posterior capsule opacification, and transient intraocular pressure elevations are still problematic [9].

The clinical presentation of the patient and the scope of the surgeon's experience often determine the decision to perform combined versus sequential surgery. Although combined surgery is convenient and result in rapid recovery, there is an added risk which includes formation of fibrin and posterior synechiae when compared to sequential surgery [10]. On the contrary, when there are significant contraindications; or when the risk of surgery is great; it may be better to have sequential surgery. Although these procedures differ, the studies suggest similar long term visual outcomes [11], and the choice is very individualized.

A renaissance in surgical visualization has seen such examples as intraoperative OCT for more precise, better outcome phacovitrectomy. With these new innovations, surgeons can evaluate surgical planes in real time and rely on more accurate results with complex patients [4]. Additionally, with the arrival of minimally invasive vitrectomy systems, 23 gauge and 25 gauge instruments gradually eradicated surgical trauma, improved the rate of recovery in patients and decreased complication rates [5].

This article is an extensive study of phacovitrectomy results and their complications. An attempt to synthesise current research in order to inform clinical decision making and maximize patient care in this complex surgical specialty.

2. MATERIAL AND METHODS

This prospective observational study was conducted at the Department of Ophthalmology, Bakhtawar Amin College, Multan, over a period of six months from January 2024 to June 2024. A total of 196 patients were enrolled. The sample size was calculated by taking the frequency of intraoperative complications as 85%, with a 95% confidence level and a 5% margin of error. A non-probability sampling technique was used to recruit patients.

Patients were included if they were undergoing combined phacoemulsification and pars plana vitrectomy for any vitreoretinal condition, aged between 20 and 80 years, and willing to comply with follow-up visits. Patients with pre-existing corneal opacity, advanced optic atrophy, history of recent intraocular surgery (within the last six months), uncontrolled systemic conditions (e.g., severe diabetes or hypertension), or incomplete medical records were excluded from the study.

Data were collected using a structured proforma. Demographic variables included gender, age (categorized as 20–40, 40–60, and 61–80 years), and side of the affected eye (left or right). The underlying vitreoretinal diagnosis was recorded and categorized as vitreous hemorrhage, rhegmatogenous retinal detachment, intraocular foreign body, epiretinal membrane, macular hole, or tractional retinal detachment. Intraocular pressure (IOP) was measured preoperatively, as well as at 1 month and 12 months postoperatively, and categorized as <10 mmHg, 10–20 mmHg, 21–30 mmHg, and >30 mmHg.

The intraoperative data included complications such as lens capsule status (intact, intraoperative rupture, preoperative rupture), usage of IRIS hooks, requirement of corneal or scleral sutures, and use of endotamponade. Postoperative complications assessed included posterior synechia, fibrin formation, and anterior segment reaction, which was graded as mild, moderate, or severe.

Phacoemulsification was performed to remove the cataract, and an intraocular lens was implanted. This was followed by pars plana vitrectomy to address the underlying vitreoretinal pathology. Intraoperative decisions, such as the use of sutures or endotamponade, were made based on individual surgical requirements.

Patients were followed up at baseline (preoperative), at 1 month, and at 12 months postoperatively. At each visit, clinical assessments were performed, and data regarding IOP, anterior segment reaction, and any postoperative complications were documented. The final outcomes were evaluated at the end of the study period.

Data were analyzed using SPSS version 24. Continuous variables were expressed as mean \pm standard deviation, while categorical variables were expressed as frequencies and percentages. Comparative analyses were performed using the paired

t-test for comparisons of IOP across time points. A p-value ≤ 0.05 was considered statistically significant.

3. RESULTS

A total of 196 patients were included in the study. The mean age of the patients was 47.93 years (SD \pm 12.381). The mean preoperative intraocular pressure (IOP) was 14.65 mmHg (SD \pm 3.693). At one month postoperatively, the mean IOP increased to 16.80 mmHg (SD \pm 6.403), and at 12 months postoperatively, the mean IOP was 16.31 mmHg (SD \pm 6.078).

The comparison of preoperative and postoperative intraocular pressure (IOP) revealed statistically significant differences at both 1 month and 12 months postoperatively. The mean IOP increased from **14.65 mmHg preoperatively to 16.80 mmHg at 1 month** (p = 0.000) and slightly decreased to **16.31 mmHg at 12 months** (p = 0.002). Despite the slight decrease at 12 months, the IOP remained significantly elevated compared to the preoperative levels. This suggests that the procedure resulted in a measurable but controlled elevation of IOP, which may be clinically relevant in monitoring postoperative outcomes. (Table 1)

The frequency distribution of intraoperative and postoperative complications shows that among intraoperative complications, the lens capsule remained intact in 157 (80.1%) cases, while **intraoperative rupture** occurred in 21 (10.7%) cases and **preoperative rupture** in 18 (9.2%) cases. **Corneal sutures** were required in 57 (29.1%) cases, whereas **scleral sutures** were used more frequently in 141 (71.9%) cases. **IRIS hooks** were utilized in 42 (21.4%) cases, and **endotamponade** was performed in 162 (82.7%) cases.

For postoperative complications, **posterior synechia** was observed in 21 (10.7%) cases, while 175 (89.3%) cases had no synechia. **Mild anterior segment reaction** was the most common, occurring in 158 (80.6%) cases, followed by **severe reaction** in 29 (14.8%) cases and **moderate reaction** in 9 (4.6%) cases. **Fibrin presence** was noted in 40 (20.4%) cases, while 156 (79.6%) cases had no fibrin formation.

These findings indicate that while most complications were mild or manageable, certain intraoperative challenges like the frequent need for scleral sutures and postoperative reactions like fibrin presence require close monitoring and management. (Table 2)

Table 1: Comparison of Preoperative and Postoperative Intraocular Pressure (IOP) at 1 Month and 12 Months

Pair	Mean (mmHg)	SD (mmHg)	Sig. (2-tailed)
Preoperative IOP vs. IOP at 1 Month	14.65 vs. 16.80	3.693, 6.403	0.000
Preoperative IOP vs. IOP at 12 Months	14.65 vs. 16.31	3.693, 6.078	0.002

Table 2: Intraoperative and Postoperative Complications

Complication	Category	Frequency (n)	Percentage (%)
Intraoperative Complications			
Lens Capsule Status	Intact	157	80.1
	Intraoperative Rupture	21	10.7
	Preoperative Rupture	18	9.2
Corneal Suture	Yes	57	29.1
	No	139	70.9
Scleral Suture	Yes	141	71.9
	No	55	28.1
IRIS Hook Used	Yes	42	21.4
	No	154	78.6
Endotamponade	Yes	162	82.7

Complication	Category	Frequency (n)	Percentage (%)
	No	34	17.3
Postoperative Complications			
Posterior Synechia	Yes	21	10.7
	No	175	89.3
Anterior Segment Reaction	Mild	158	80.6
	Moderate	9	4.6
	Severe	29	14.8
Fibrin Presence	Yes	40	20.4
	No	156	79.6

4. DISCUSSION

Phacoemulsification combined with pars plana vitrectomy (phacovitrectomy) has emerged as a preferred surgical technique for managing coexisting anterior and posterior segment pathologies, offering the advantage of simultaneous treatment of cataracts and vitreoretinal disorders. The findings of our study, supported by existing literature, demonstrate that this combined procedure is both effective and relatively safe, albeit with some manageable complications.

Our results indicate a significant but controlled increase in intraocular pressure (IOP) postoperatively, which aligns with previous studies that emphasize the importance of IOP monitoring in postoperative care. Abidin et al. reported no severe IOP elevation after phacovitrectomy, further highlighting the efficacy of this procedure in maintaining ocular pressure within acceptable limits [12]. Similarly, Sizmaz et al. found no substantial postoperative IOP increases, confirming that IOP changes are manageable with appropriate follow-up [13].

Intraoperative complications, such as posterior capsule rupture and the frequent need for scleral sutures, were observed in our study and are consistent with findings by Sizmaz et al., who reported posterior capsule rupture in 8.3% of cases [13]. Farahvash et al. also noted an increased risk of posterior synechia and fibrin formation in combined surgeries, underscoring the need for meticulous surgical techniques [14].

Postoperative complications in our study, such as anterior segment reaction and fibrin presence, are comparable to those reported by Fouad et al. They found no significant differences in cystoid macular edema or recurrent epiretinal membrane formation between combined and sequential surgeries, indicating that both approaches offer similar safety profiles [15]. Tan et al. further supported this, showing that the anatomical and functional outcomes of phacovitrectomy are comparable to those of sequential surgery, though the combined procedure may result in a slight myopic shift [16].

Daud et al. provided additional insight into the advantages of phacovitrectomy for macular hole and epiretinal membrane, emphasizing its role in avoiding multiple surgeries and expediting recovery [17]. Similarly, Le et al. highlighted the reduced surgical burden and expedited visual recovery associated with combined surgeries, though they noted the potential for increased postoperative inflammation and refractive unpredictability [18]. These observations align with our findings, where most complications were mild and manageable with appropriate postoperative care.

While phacovitrectomy offers several advantages, the importance of individualized patient selection cannot be overstated. As noted by Canan et al., the outcomes and complications largely depend on the underlying pathology, with conditions such as proliferative diabetic retinopathy requiring more intensive postoperative management [19]. Gershoni et al. further emphasized the need for tailored interventions, such as intraoperative anti-VEGF administration and postoperative anti-inflammatory regimens, to minimize complications in diabetic retinopathy patients [20].

In conclusion, our study reaffirms the safety and efficacy of phacovitrectomy for managing coexisting cataracts and vitreoretinal diseases. While certain intraoperative and postoperative complications necessitate close monitoring, the overall benefits of combined surgery, including reduced surgical interventions and faster visual recovery, make it a valuable option in appropriately selected patients.

5. CONCLUSION

Pars plana vitrectomy combined with phacoemulsification resulted in a significant but controlled rise in intraocular pressure

that emphasized the need for regular postoperative follow up. Most of the intraoperative and postoperative complications were mild and not associated with significant morbidity. Although there are certain hurdles, which include the necessity for scleral sutures and fibrin formation, surgical technique must be meticulously performed and postoperative management carefully carried out in order to obtain optimal results.

REFERENCES

- [1] Chiras D, Dervenis N, Dervenis P, Verma S. Phacoemulsification outcomes and complications in vitrectomized versus non-vitrectomized eyes. *Clin Exp Optom*. 2021;104(6):859-863.
- [2] Rey A, Jürgens I, Maseras X, et al. Visual outcome and complications of cataract extraction after pars plana vitrectomy. *Clin Ophthalmol*. 2018;12:989-994.
- [3] Karadağ M. Three-year results of combined pars plana vitrectomy and phacoemulsification in diabetic vitreous hemorrhage. *J Health Sci Med*. 2022;1:1-7.
- [4] Port AD, Nolan JG, Siegel NH, et al. Phacovitrectomy provides lower costs and better vision gains than sequential surgery. *Graefes Arch Clin Exp Ophthalmol*. 2020;259:45-52.
- [5] Cayatopa FS, Méndez AL, Ortiz RB, Díaz AS, Estrada FG. Pars plana vitrectomy combined with phacoemulsification in narrow anterior chambers. *Clin Ophthalmol*. 2021;15:4181-4187.
- [6] Noh HJ, Kim S. Combined treatment of phacoemulsification and limited pars plana vitrectomy in angle-closure glaucoma. *Int J Ophthalmol*. 2019;12(6):974-979.
- [7] Gandhi P, Radhakrishnan N, Shekhar M. Outcomes of phacoemulsification in previously vitrectomized eyes. *TNOA J Ophthalmic Sci Res*. 2019;57(1):17-20.
- [8] Gershoni A, Barayev E, Jbara D, et al. Postoperative complications of combined phacoemulsification and pars plana vitrectomy in diabetic retinopathy patients. *Front Med*. 2022;9:978346.
- [9] Ma Q, Fan F, Zhao Z, et al. Combined phacoemulsification and vitrectomy with gas tamponade for idiopathic macular hole. *Exp Ther Med*. 2018;17(1):525-530.
- [10] Besozzi G, Di Salvatore A, Cardillo D, et al. Intracameral cefuroxime in combined pars plana vitrectomy and phacoemulsification: A study of safety. *Clin Ophthalmol*. 2018;12:1567-1570.
- [11] Coussa R, Antaki F, Dirani A, et al. Primary combined pars plana vitrectomy and phacoemulsification with anterior segment removal of posterior segment intraocular foreign bodies. *J VitreoRetinal Dis*. 2018;2:79-86.
- [12] Abidin AZ, Rehman MU, Dayal SM. Outcome and complications of phacoemulsification combined with pars plana vitrectomy. *Age (years)*. 2021;20(40):3.
- [13] Sizmaz S, Esen E, Isik P, Cam B, Demircan N. Outcome and complications of combined phacoemulsification and 23-gauge pars plana vitrectomy. *J Ophthalmol*. 2019;2019(1):7918237.
- [14] Farahvash A, Popovic MM, Eshtiaghi A, Kertes PJ, Muni RH. Combined versus sequential phacoemulsification and pars plana vitrectomy: a meta-analysis. *Ophthalmology Retina*. 2021 Nov;5(11):1125-38.
- [15] Fouad YA, Soliman MK, Elhousseiny AM, Yang YC, Sallam AB. Visual outcomes and complications of combined versus sequential pars plana vitrectomy and phacoemulsification for epiretinal membrane. *Eye*. 2024 Mar 14:1-7.
- [16] Tan A, Bertrand-Boiché M, Angioi-Duprez K, Berrod JP, Conart JB. Outcomes of combined phacoemulsification and pars plana vitrectomy for rhegmatogenous retinal detachment: a comparative study. *Retina*. 2021 Jan;41(1):68-74.
- [17] Daud F, Daud K, Popovic MM, Yeung S, You Y, Pimentel MC, Yan P. Combined versus Sequential Pars Plana Vitrectomy and Phacoemulsification for Macular Hole and Epiretinal Membrane: A Systematic Review and Meta-Analysis. *Ophthalmology Retina*. 2023 Apr 6.
- [18] Le NT, Marshall B, Houser KH, Khandelwal SS. Combined Pars Plana Vitrectomy, Phacoemulsification, and Intraocular Lens Implantation: A review on the Advantages and Limitations of Phacovitrectomy. 2022 May 12.
- [19] Canan H, Sizmaz S, Altan-Yaycioglu R. Surgical results of combined pars plana vitrectomy and phacoemulsification for vitreous hemorrhage in PDR. *Clin Ophthalmol*. 2013 Aug 8:1597-601.
- [20] Gershoni A, Barayev E, Jbara D, Hadayer A, Axer-Siegel R, Dotan A, Gal-Or O, Tuuminen R, Ehrlich R. Postoperative complications of combined phacoemulsification and pars plana vitrectomy in diabetic retinopathy patients. *Front Med*. 2022 Sep 30;9:978346