



## Original Article

## Evaluating the Efficacy of Combined Surgery for Cataract and Glaucoma: A Comparative Analysis of Visual Acuity, Intraocular Pressure, and Anterior Chamber Depth

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## ABSTRACT

Glaucoma is characterized by an abnormal increase in intraocular pressure, leading to optic nerve damage and permanent visual impairment. Cataract is characterized by lens opacity that impairs vision but can be reversed. **Objective:** To compare pre and post-operative average visual acuity, intraocular pressure, anterior chamber angle, and anterior chamber depth in patients with cataract and narrow angle glaucoma undergoing combined phacoemulsification, intraocular lens implantation, and trabeculectomy. **Methods:** A quasi-experimental study was carried out at Niazi Welfare Foundation Teaching Hospital Sargodha from June 2022 to December 2023. Total 107 patients with both cataracts and narrow angle glaucoma were included. Post-surgery, average visual acuity, intraocular pressure, anterior chamber angle, and anterior chamber depth were assessed at various postoperative intervals (1 day, 1 week, 1 month, 3 months, and 6 months). The Patient's symptoms improved, with visual acuity and average anterior chamber depth increasing by more than 50% compared to pre-surgery was considered as significant. Data were analyzed by SPSS version 25.0. P-value <0.05 was considered as significant. **Results:** Results of the study yielded significant improvements in average visual acuity, intraocular pressure (IOP), anterior chamber angle, and anterior chamber depth post-operatively with complication rate of 6.52%. **Conclusions:** We concluded that combined phacoemulsification with intraocular lens implantation (IOL) and trabeculectomy may be an effective approach for managing intraocular pressure (IOP) and improving visual acuity in patients with narrow angle glaucoma and cataract.

## INTRODUCTION

Glaucoma is characterized by an abnormal increase in intraocular pressure, leading to optic nerve damage and permanent visual impairment whereas cataracts result from lens opacity that impairs vision [1, 2]. The vision loss from glaucoma is irreversible, while cataract-induced vision loss can be reversed [3]. Cataracts are the leading cause of blindness globally, affecting around 15.2 million people and accounting for approximately 51% of blindness cases. Glaucoma is the third most common cause of visual

impairment worldwide, impacting about 3.6 million individuals [4]. In Asia, the incidence of these diseases is notably high. The region accounts for over half of the global burden of cataracts, largely due to a higher prevalence of risk factors such as UV exposure, malnutrition, and limited access to healthcare. Glaucoma prevalence in Asia is also significant, with primary angle-closure glaucoma being particularly common [5]. In Pakistan, cataracts are the primary cause of blindness, responsible for about 60-80%

of all blindness cases [6]. Glaucoma is a major public health concern, with many undiagnosed and untreated cases leading to severe vision loss. Cataract and glaucoma are the two main causes of blindness in Pakistan, contributing to 12.2% and 7.1% of cases, respectively. It is estimated that a considerable proportion of patients undergoing cataract surgery also have concurrent glaucoma [7]. Cataracts primarily manifest as blurred vision and progressive visual decline [2]. After the onset of the disease, the patient's lens increases in volume during the expansion period, causing the iris septum to move forward [8]. The increase in intraocular pressure may even induce glaucoma. Senile cataracts typically occur due to age-related lens degeneration [9]. In the early stages, mild lens opacity has a minimal effect on vision, but as it advances, vision deteriorates and can lead to blindness [10]. In patients with both cataract and glaucoma, the consequences are often severe and complex leading to exacerbated visual impairment, greatly reducing the patient's quality of life [11]. Cataract cause clouding of the eye's lens, leading to blurred vision, glare, color distortion, and difficulties in daily activities like reading and driving [12]. At the same time, glaucoma progressively damages the optic nerve, causing peripheral vision loss, tunnel vision, and potentially complete blindness if left untreated [13]. Current treatment for cataract involves phacoemulsification with intraocular lens implantation, which is widely regarded as the gold standard [14]. For glaucoma, the management includes medications, laser therapy, and surgical interventions like trabeculectomy [15]. However, these treatments have their shortcomings. Cataract surgery alone does not address the elevated intraocular pressure (IOP) in glaucoma patients, and glaucoma surgeries like trabeculectomy can be associated with complications and variable success rates [16]. Phacoemulsification cataract extraction can crush the hardened lens nucleus into a chyle through the front ultrasonic needle, and the emulsified lens tissue is sucked out by the perfusion suction system, which does not affect the constant fluid flow in the eye. This treatment method has the advantages of minimal trauma, mild postoperative reaction, and promotes the patient's vision to recover as soon as possible after surgery [17]. However, phacoemulsification cataract extraction cannot effectively solve iris bulging and angle adhesion. Combined with trabeculectomy surgery, the sinus trabecular tissue and surrounding iris tissue can be directly removed after the lens is implanted [18]. The combination of phacoemulsification, intraocular lens implantation, and trabeculectomy in a single procedure is a newer approach aimed at addressing both cataract and glaucoma simultaneously. This combined surgery has several benefits, including a single recovery period, reduced overall risk of complications compared to separate

surgeries, and improved patient compliance. Additionally, it offers the potential for better visual outcomes and more effective IOP control, making it a promising alternative to the current standard of care [17].

Therefore, understanding these effects is crucial to evaluate the impact of surgical interventions on visual acuity, intraocular pressure, anterior chamber angle, and anterior chamber depth. By investigating these parameters, we aim to provide insights into the comprehensive benefits of the combined surgical approach in managing cataract and angle closure glaucoma for optimizing treatment strategies and improving clinical outcomes.

## METHODS

Quasi experimental study was conducted from June 2022 to December 2023 at Niazi Welfare Foundation Teaching Hospital Sargodha, involving 107 patients with both cataracts and narrow angle glaucoma. The sample size was calculated based on the assumption that the decrease in IOP (outcome variable) pre- and postoperatively by using the mean differences in intra-ocular pressure (1.311+ 2.97 mmHg) at an alpha level of 0.05 and power of 90% [19]. Non-probability convenient sampling method was used. The study received IRB approval (NM&DC/IRB/128 on dated 1st June, 2022) and informed consent was obtained from all participants. Inclusion criteria for the study were: a) Patients on gonioscopy showing a Schaffer grading of 2 or less in at least two quadrants for narrow angle glaucoma; b) Patients with nuclear sclerosis grade-I, cortical, posterior subcapsular & mixed cataract; c) Patients who had undergone conservative treatment for angle closure glaucoma with two or more drugs before surgery, without improvement in IOP, anterior chamber depth; d) patients having IOP > 21mmHg; e) Patients having increased cup-to-disc ratio ( $\geq 0.6$ ) with corresponding visual field defects; f) Presence of lens opacification affecting vision, assessed using the Lens Opacities Classification System III (LOCS III) at slit lamp. An exclusion criterion was: a) Retinal detachment; b) Advanced corneal disease; c) Patients with severe visual impairment (e.g. worse than 20/200) primarily due to other ocular conditions; d) Patients with NPL; e) Severe liver and kidney diseases to minimize perioperative risks & ensure proper postoperative recovery; f) Previous ocular surgeries; g) Mental illness. The demographic characteristics of the participants were documented. Prior to the procedure, clinical data such as treatment regimen, average visual acuity, intraocular pressure, anterior chamber angle, and anterior chamber depth were also recorded. Patients underwent phacoemulsification cataract extraction, intraocular lens implantation, and trabeculectomy. Post-surgery, average visual acuity, intraocular pressure, anterior chamber angle, and anterior chamber depth were assessed at various postoperative intervals (1 day, 1 week, 1 month, 3 months,

and 6 months). 1 month post-operative findings were compared with pre-operative to assess the study outcome. The outcomes were categorized as follows: 1) Effective: Patient's symptoms improved, with visual acuity and average anterior chamber depth increasing by more than 50% compared to pre-surgery; 2) Ineffective: Patient's symptoms showed no significant improvement, and visual acuity did not recover. Statistical analysis was conducted using SPSS 24.0 software. Treatment indicators, including visual acuity and intraocular pressure, were represented as ( $\bar{x} + s$ ), and paired t-test was utilized to compare treatment effects pre- and post-surgery. A significance level of  $p < 0.05$  was considered statistically significant.

## RESULTS

The study involved 107 patients, comprising 62 males (58%) and 45 females (42%), aged between 56 and 87 years, with an average age of (71.52±5.76) years. The duration of the disease ranged from 3 to 6 years, with an average of (3.15±1.22) years are shown in Table 1.

**Table 1:** Demographic Characteristic

Characteristics	N (%)
Male	62(58)
Female	45(42)
Age (Y)	56 - 87
Mean Age (Y)	71.52 ± 5.76
Disease Duration (Y)	3 - 6
Mean Duration (Y)	3.15 ± 1.22

The analysis of ophthalmic parameters revealed a notable difference in average visual acuity, intraocular pressure, anterior chamber angle, and anterior chamber depth. These parameters showed significant improvement compared to their pre-treatment values ( $p < 0.05$ ), as shown in Table 2.

**Table 2:** Comparison of Ophthalmic Parameters ( $\bar{x} \pm s$ )

Parameter	Preoperative	After Surgery	p-value
Average visual acuity	0.32 ± 0.11	1.12 ± 0.21*	0.00
Mean Intraocular Pressure Measurement (mmHg)	43.52 ± 4.35	9.25 ± 1.48*	0.00
Average Anterior Chamber Angle	171.52 ± 32.52	61.52 ± 3.52*	0.00
Average Anterior Chamber Depth (mm)	1.82 ± 0.23	3.15 ± 0.31*	0.00

Note: Significant (\*) compared to the pre-treatment group,  $p < 0.05$ .

The primary complications included inflammation in the anterior chamber, corneal edema, iris injury, among others, with a total incidence of 6.98% illustrated in table 3.

**Table 3:** Post-operative Complication Rate N (%)

Number of Cases	Anterior Chamber Inflammation	Corneal Edema	Iris Injury	Overall Incidence
107	3 (2.8)	2 (1.86)	2 (1.86)	7 (6.52)

## DISCUSSION

Cataract and glaucoma are prevalent eye diseases. Cataracts typically result from metabolic imbalances in the lens, leading to protein denaturation and cloudiness. Symptoms include blurred vision, sensitivity to light, and dimmer vision [3]. Glaucoma is characterized by a sustained increase in intraocular pressure, which can harm various eye tissues and visual function. Severe damage to the optic nerve can result in permanent, irreversible blindness. Hence, prompt and effective treatment is crucial for improving the prognosis of patients with these conditions [9]. Currently, surgery stands out as the most effective treatment for patients dealing with both cataracts and narrow angle glaucoma [17]. However, numerous studies indicate that managing only glaucoma in such cases could exacerbate cataract formation, while solely addressing cataracts may not resolve the damage inflicted by narrow angles glaucoma, leaving the risk of blindness unmitigated. This underscores the challenge of achieving optimal treatment outcomes with a single approach [15]. In this study, phacoemulsification cataract extraction, intraocular lens implantation and trabeculectomy were performed on patients with cataract and narrow angle glaucoma. The results showed that post-surgery, there was a significant improvement in average visual acuity, intraocular pressure, anterior chamber angle, and anterior chamber depth ( $p < 0.05$ ). This treatment approach appears to be more effective for patients, enhancing their vision significantly. A study conducted by Wang B et al., about the effects of combining phacoemulsification and intraocular lens implantation with trabeculectomy. The results demonstrated that the overall effective rate in the observation group was significantly higher compared to the control group ( $P < 0.05$ ). Additionally, in another research, patients in the observation group showed greater improvements in both vision and anterior chamber depth than those in the control group, highlighting the effectiveness of the combined surgical approach in enhancing ophthalmic outcomes [18]. Other research studies also provide comprehensive data regarding the effects of phacoemulsification, intraocular lens (IOL) implantation, and trabeculectomy on various ophthalmic parameters. These studies consistently depict significant improvements in visual acuity post-operatively, highlighting the effectiveness of these combined surgical procedures in enhancing patient outcomes [20]. The post-surgery complication rate was minimal at 6.52%. Other Research studies also indicate a lower incidence of complications following phacoemulsification cataract aspiration, intraocular lens implantation combined with trabeculectomy [21]. This study provides a comprehensive approach for patients with both cataract and narrow angle glaucoma, addressing multiple aspects of ophthalmic parameter such as visual acuity, intraocular pressure, anterior chamber angle, and anterior chamber depth. By using a quasi-experimental design, the study can provide

valuable insights into real-world outcomes, ensuring the results are applicable to clinical practice. However, the study also has some limitations. Despite these limitations, the study's comprehensive assessment of combined surgical interventions in a specific patient population provides valuable data that can inform future clinical practices and research.

## CONCLUSIONS

Phacoemulsification cataract extraction, intraocular lens implantation and trabeculectomy on patients with cataract and narrow angle glaucoma is of paramount significance as it remarkably improves the patients' visual acuity along with other ophthalmic parameters.

## Authors Contribution

Conceptualization: MSM

Methodology: MSM

Formal analysis: MZC, SAS, UTM, NS

Writing-review and editing: MA

All authors have read and agreed to the published version of the manuscript.

## Conflicts of Interest

The authors declare no conflict of interest.

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## REFERENCES

- [1] Kreft D, Doblhammer G, Guthoff RF, Frech S. Prevalence, incidence, and risk factors of primary open-angle glaucoma—a cohort study based on longitudinal data from a German public health insurance. *BMC Public Health*. 2019 Dec; 19: 1-4. doi: 10.1186/s12889-019-6935-6.
- [2] Alshamrani AZ. Cataracts pathophysiology and managements. *The Egyptian Journal of Hospital Medicine*. 2018 Jan; 70(1): 151-4. doi: 10.12816/0042978.
- [3] Grehn F and Klink T. Management of glaucoma and cataract. In: Daniel MA, Joan WM, Dimitri TA, Lucy H, editors. *Young Albert and Jakobiec's principles and practice of ophthalmology*. Springer International Publishing; 2022.p.1901-1921. doi: 10.1007/978-3-030-42634-7\_160.
- [4] Steinmetz JD, Bourne RR, Briant PS, Flaxman SR, Taylor HR, Jonas JB *et al*. Causes of blindness and vision impairment in 2020 and trends over 30 years, and prevalence of avoidable blindness in relation to VISION 2020: the Right to Sight: an analysis for the Global Burden of Disease Study. *The Lancet Global Health*. 2021 Feb; 9(2): 144-60. doi: 10.1016/S2214-109X(20)30489-7.
- [5] Wang Y, Cun Q, Li J, Shen W, Yang WY, Tao YJ *et al*. Prevalence, ethnic differences and risk factors of primary angle-closure glaucoma in a multiethnic Chinese adult population: the Yunnan Minority Eye Study. *British Journal of Ophthalmology*. 2023 May; 107(5): 677-82. doi: 10.1136/bjophthalmol-2021-320241.
- [6] Jadoon Z, Shah SP, Bourne R, Dineen B, Khan MA, Pakistan National Eye Survey Study Group *et al*. Cataract prevalence, cataract surgical coverage and barriers to uptake of cataract surgical services in Pakistan: the Pakistan National Blindness and Visual Impairment Survey. *British Journal of Ophthalmology*. 2007 Oct; 91(10): 1269-73. doi: 10.1136/bjo.2006.106914.
- [7] Dineen B, Bourne RR, Jadoon Z, Shah SP, Khan MA, Foster A *et al*. Causes of blindness and visual impairment in Pakistan. The Pakistan national blindness and visual impairment survey. *British journal of ophthalmology*. 2007 Aug; 91(8): 1005-10. doi: 10.1136/bjo.2006.106914.
- [8] Delbarre M and Froussart-Maille F. Signs, symptoms, and clinical forms of cataract in adults. *Journal Francais D'ophtalmologie*. 2020 Jun; 43(7): 653-9. doi:10.1016/j.jfo.2019.11.009.
- [9] Cicinelli MV, Buchan JC, Nicholson M, Varadaraj V, Khanna RC. Cataracts. *The Lancet*. 2023 Feb; 401(10374): 377-89. doi: 10.1016/S0140-6736(22)01839-6.
- [10] Jiménez-Román J, Prado-Larrea C, Laneri-Pusineri L, Gonzalez-Salinas R. Combined glaucoma and cataract: an overview. Difficulties in cataract surgery. 2018 Jun; 79-89. doi: 10.5772/intech open.73584.
- [11] Kyari F. Managing cataract surgery in patients with glaucoma. *Community Eye Health*. 2019; 31(104): 88.
- [12] Cassel GH. *The eye book: a complete guide to eye disorders and health*. JHU Press; 2021. doi: 10.56021/9781421440002.
- [13] Goldberg I, Goldmann N. *Fighting Glaucoma: An Action Handbook*. Kugler Publications; 2018.
- [14] Chen X, Xu J, Chen X, Yao K. Cataract: advances in surgery and whether surgery remains the only treatment in future. *Advances in Ophthalmology Practice and Research*. 2021 Nov; 1(1): 100008. doi:10.1016/j.aopr.2021.100008.
- [15] Lusthaus J and Goldberg I. Current management of glaucoma. *Medical Journal of Australia*. 2019 Mar; 210(4): 180-7. doi: 10.5694/mja2.50020.
- [16] Tsakiris K, Kontadakis G, Georgoudis P, Gatziofufas Z, Vergados A. Surgical and perioperative considerations for the treatment of cataract in eyes with glaucoma: A literature review. *Journal of*



- Ophthalmology. 2021; 2021(1): 5575445. doi: 10.1155/2021/5575445.
- [17] Zhang Y, Cheng G, Chen Y, Bian A, Zhou Q, Li L, Zhang S. Comparison of long-term effects following phacoemulsification combined with goniosynechialysis and trabeculectomy in patients with primary angle-closure glaucoma and cataract. *Ophthalmology and Therapy*. 2024 Jan; 13(1): 423-34. doi:10.1007/s40123-023-00823-9.
- [18] Wang B and Tang L. analysis of the effect of phacoemulsification and intraocular lens implantation combined with trabeculectomy on cataract and its influence on corneal endothelium. *Frontiers in Surgery*. 2022 Feb; 9: 841296. doi: 10.3389/fsurg.2022.841296.
- [19] Iqbal S, Ahmad S, Qayyum S, Firdous M. Effect of phacoemulsification on intraocular pressure in glaucoma patients. *Journal of Shifa Tameer-e-Millat University*. 2022; 5(2): 75-80. doi: 10.32593/jstmu/Vol5.Iss2.198.
- [20] Senthil S, Rao HL, Choudhari N, Garudadri C. Phacoemulsification versus phacotrabeculectomy in medically controlled primary angle closure glaucoma with cataract in an Indian cohort: a randomized controlled trial. *International Ophthalmology*. 2022 Jan; 42(1): 35-45. doi:10.1007/s10792-021-01997-6.
- [21] Li X, Liu Y, Li Y, Wang M. Effects of modified trabeculectomy combined with phacoemulsification and intraocular lens implantation on intraocular pressure and complications in patients with primary open angle glaucoma. *International Journal of Clinical and Experimental Medicine*. 2019 Jan; 12(2): 1778-84.