

Visual recovery after phacoemulsification surgery: assessing the role of age and gender

 Ceren Türkoğlu

Department of Ophthalmology, Faculty of Medicine, Lokman Hekim University, Ankara, Türkiye

Cite this article as: Türkoğlu C. Visual recovery after phacoemulsification surgery: assessing the role of age and gender. *J Health Sci Med.* 2025;8(6):1129-1132.

Received: 05.09.2025

Accepted: 12.10.2025

Published: 25.10.2025

ABSTRACT

Aims: There is a need for more comprehensive resources on whether visual outcomes after phacoemulsification surgery are affected by age and gender. This study investigates visual changes in relation to age and gender following this procedure. This study aims to explore the differences in visual recovery after phacoemulsification surgery between patients aged 50-69 and those aged 70 and above, with a focus on gender-related differences in outcomes.

Methods: This retrospective, single-center, cross-sectional study included 185 eyes of 185 patients aged 50 and above who underwent phacoemulsification. Patients were divided into two groups; group 1 (50-69 years) and group 2 (70+ years). Preoperative best-corrected visual acuity (BCVA), intraocular pressure, and other ocular parameters were measured. Postoperative follow-up occurred at 1, 3, 6, and 12 months. Statistical analyses were performed to evaluate differences in visual recovery between age groups and genders.

Results: Statistically significant improvements in BCVA and IOP were observed between preoperative and all postoperative time points ($p < 0.001$). However, no significant differences were found in BCVA improvement, IOP changes, or complication rates between the two age groups or between male and female patients. The complication rate was 3.8% intraoperatively and 1.6% postoperatively, with no significant gender-related differences. These findings suggest that with a standardized surgical approach, patient outcomes are consistent. This highlights the importance of surgical experience in patient counseling and surgical planning, indicating that excellent results can be expected regardless of age or gender.

Conclusion: Phacoemulsification surgery leads to significant improvements in visual acuity and IOP. The experience of the surgeon may play a pivotal role in minimizing complications and ensuring similar positive outcomes for both male and female patients across various age groups. Larger, multicenter studies are recommended to further validate these findings and explore outcomes in patients with comorbidities.

Keywords: Phacoemulsification, visual acuity, gender, age, intraocular pressure

INTRODUCTION

Senile cataract is a leading cause of reversible blindness worldwide, predominantly affecting individuals over 50. The condition arises from the opacification of the lens due to age-related changes in lens proteins.¹ While typically bilateral, its progression can be asymmetric. Key risk factors include age, female gender, ultraviolet light exposure, diabetes mellitus, smoking, corticosteroid use, and a history of ocular trauma or surgery.^{1,2} As patients age, factors such as harder cataracts, shallower anterior chambers, smaller pupils, higher rates of exfoliation syndrome, and weaker zonules can make surgery more challenging.²

Phacoemulsification has become the standard surgical method for cataracts, favored for being less traumatic, having a shorter surgical time, and causing fewer complications than older techniques. This modern procedure involves removing the opacified lens through ultrasonic fragmentation and

implanting a clear intraocular lens, all within a closed system maintained by small incisions.³

The visual system naturally undergoes age-related functional decline. For instance, retinal ganglion cell axons are vulnerable to age-related loss, and the total axon number in the optic nerve is inversely proportional to aging.⁴ However, the specific impact of age and gender on visual recovery after phacoemulsification remains an area with insufficient research. This study aims to address this gap by investigating vision changes in two age groups (50-69 and ≥ 70 years) and between genders. The primary purpose is to determine if age and gender are significant predictors of visual recovery, thereby providing valuable data for patient counseling and managing postoperative expectations. The novelty of this study lies in its simultaneous investigation of both age and gender, offering a more integrated understanding of postoperative outcomes.

Corresponding Author: Ceren Türkoğlu, dr.cerenturkoglu@gmail.com



This work is licensed under a Creative Commons Attribution 4.0 International License.

METHODS

This retrospective, cross-sectional study was approved by the Lokman Hekim University Scientific Researches Ethics Committee (Date: 30.05.2025, Decision No: 2025/153) and adhered to the principles of the Declaration of Helsinki. The records of 185 eyes from 185 patients aged 50 and over who underwent phacoemulsification at our ophthalmology clinic over a 12-month period were analyzed. Patients with nuclear, cortical, and/or posterior subcapsular cataracts (grade 2-4, LOCS III) were included. Exclusion criteria were the presence of other ocular diseases (e.g., glaucoma, diabetic retinopathy), a history of ocular trauma, or previous ocular surgery.

Patients were divided into two age groups; group 1 (n=93, 50-69 years) and group 2 (n=92, ≥70 years). All patients underwent a comprehensive preoperative assessment, including best-corrected visual acuity (BCVA) measurement using LogMAR charts, slit-lamp biomicroscopy, detailed fundus examination, and optical biometry. Spectral domain-optical coherence tomography (SD-OCT) was used to exclude macular pathologies. A single experienced surgeon performed all phacoemulsification and monocular intraocular lens implantations to minimize inter-surgeon variability. Postoperative follow-ups were conducted at 1, 3, 6, and 12 months, recording the same parameters.

Statistical Analysis

All data analysis was performed using SPSS version 23 (SPSS Inc., Chicago, Illinois, USA). The normality of data distribution was assessed using the Shapiro-Wilk test. For normally distributed data, comparisons between two independent groups were made using the student's T test. For non-normally distributed data, the Mann-Whitney U test was applied. Paired T tests were used to compare preoperative and postoperative values within the same group. A p-value of <0.05 was considered statistically significant. Based on a post hoc power analysis with α=0.05, power=0.80, and a medium effect size, the minimum required sample size was 88 eyes per group. The study included 185 eyes in total, meeting this requirement.

RESULTS

Out of the 185 patients, 185 eyes were included. The mean age of the patients was 68.30±0.51 and 94 (50.8%) were female and 91 (49.2%) were male. Ninety (48.6%) of the patients underwent surgery on the right eye and 95 (51.4%) on the left eye. The mean age of the 93 patients in group 1 was 62.81±0.47 and 51 (54.8%) were female and 42 (45.2%) were male. Of the patients in group 1, 48 (51.6%) were operated on the right eye

and 45 (48.4%) on the left eye. The mean age of the 92 patients in group 2 was 73.84±0.41, and 43 (46.7%) of the patients were female and 49 (53.3%) were male. Of the patients in group 2, 42 patients (45.7%) underwent surgery on the right eye and 50 patients (54.3%) on the left eye.

Considering the pre-operative (pre-op) refractive properties of the patients, the spherical value of 185 patients was -1.32±2.48, the cylindrical value was -1.19±0.80, and the cylindrical axis value was 83.83±51.34. The spherical value of the patients in group 1 was -1.32±2.65, the cylindrical value was -1.13±0.81, and the cylindrical axis value was 81.69±55.66. The spherical value of the patients in group 2 was -1.32±2.32, the cylindrical value was -1.26 ±0.79, and the cylindrical axis value was 85.98±46.77. The postoperative (post-op) 12th month spherical value was determined as 0.11±0.31 and there was a statistically significant difference with the pre-op value (p<0.001). The post-op cylindrical value was determined as -0.70±0.04 and there was a statistically significant difference with the pre-op value (p<0.001). The cylindrical axis value was determined as 82.68±3.99 and there was no statistically significant difference with the pre-op value (p=0.8).

Considering BCVA changes for all patients during phacoemulsification surgery, a statistically significant difference was found between preoperative BCVA and post-operative 1-month, post-operative 3-month, post-operative 6-month and post-operative 12-month periods (p<0.001). Similar statistically significant differences were observed in both group 1 and group 2 patients between preoperative BCVA and all postoperative time points (p<0.001). The BCVA changes of the patients over 12 months are given in [Table 1](#).

No statistically significant difference was found between pre-operative and post-operative 1, 3, 6 and 12-month BCVA changes of the patients (p=0.47, 0.64, 0.66, 0.67, respectively). In addition, when groups 1 and 2 were compared, it was found that there was no statistically significant between pre-operative and post-operative 1, 3, 6 and 12-month BCVA changes (p=0.34, 0.26, 0.24, 0.25, respectively).

Pre-postoperative intraocular pressure values of the patients were compared. A statistically significant difference was found between preoperative IOP and postoperative 1-month, 3-month, 6-month, and 12-month IOP values (p<0.001). Examination of both group 1 and group 2 revealed a statistically significant difference between preoperative IOP and postoperative 1-month, 3-month, 6-month, and 12-month IOP values (p<0.001). The IOP changes of the patients are given in [Table 2](#).

Table 1. Changes of BCVA values throughout 12 months

	Pre-op	Post-op 1-month	Post-op 3-month	Post-op 6-month	Post-op 12-month
All patients (n=185)	0.66±0.36	0.12±0.23 p<0.001	0.05±0.06 p<0.001	0.04±0.06 p<0.001	0.04±0.06 p<0.001
Group 1 (n=93)	0.62±0.34	0.09±0.09 p<0.001	0.03±0.05 p<0.001	0.03±0.05 p<0.001	0.03±0.05 p<0.001
Group 2 (n=92)	0.71±0.36	0.15±0.31 p<0.001	0.06±0.07 p<0.001	0.06±0.07 p<0.001	0.06±0.07 p<0.001

Pre-op: Pre-operative, Post-op: Post-operative, BCVA: Best corrected visual acuity

Table 2. Changes of IOP values throughout 12 months

IOP values	Pre-op	Post-op 1-month	Post-op 3-month	Post-op 6-month	Post-op 12-month
All patients	15.22±2.51	14.08±2.45 p<0.001	13.66±2.18 p<0.001	13.23±2.16 p<0.001	12.92±2.05 p<0.001
Group 1	14.98±2.52 p<0.001	13.95±2.54 p<0.001	13.49±2.29 p<0.001	13.12±2.31 p<0.001	12.75±2.19 p<0.001
Group 2	15.46±2.48 p<0.001	14.22±2.37 p<0.001	13.84±2.06 p<0.001	13.35±2.01 p<0.001	13.10±1.90 p<0.001

IOP: Intraocular pressure, Pre-op: Pre-operative, Post-op: Postoperative

Considering the pre-operative and post-operative IOP values no statistically significant difference was found between male and female patients ($p>0.05$). In female patients, a statistically significant difference was found between pre-operative IOP and post-operative 1-month, 3-month, 6-month and 12-month IOP values ($p<0.001$). Similarly, in male patients, a statistically significant difference was found between preoperative IOP and postoperative 1-month, 3-month, 6-month, and 12-month IOP values ($p<0.001$).

Regarding the complication rate, 3.8% of patients developed intraoperative complications (posterior capsule opening, zonule dialysis). While 1.6% of intra-operative complications occurred in group 1, 2.2% in group 2. Postoperative complications (seidel) were observed in 1.6% of the patients. While 1.1% of post-operative complications occurred in group 1, 0.5% in group 2.

DISCUSSION

This study investigated the impact of age and gender on visual recovery after phacoemulsification surgery and found that neither factor significantly influenced postoperative outcomes in our cohort. Significant improvements in both BCVA and IOP were observed across all patients, reinforcing the high efficacy and safety of modern cataract surgery. The key finding is that when surgery is performed by an experienced surgeon on patients without significant ocular comorbidities, excellent and comparable visual recovery can be expected across different age groups and genders.

Our results align with some previous studies. For instance, Ben-Eli et al.⁵ also reported similar visual outcomes for younger and older patients after phacoemulsification. While some literature suggests older patients may face higher risks due to factors like zonular weakness or smaller pupils,^{6,7} our findings indicate that these age-related challenges may not translate to poorer outcomes when managed by an experienced surgeon. Similarly, a study by Toyama et al.² found comparable visual acuity and complication rates between patients <80 and ≥90 years old, though they noted less favorable outcomes in patients with diabetes. Our study, by excluding such comorbidities, isolates the effect of age and demonstrates its limited impact on recovery under ideal conditions.

The role of gender in cataract surgery outcomes remains debated. Some studies have suggested women may experience worse outcomes, potentially due to anatomical or hormonal differences.^{8,9} However, our findings are consistent with other research, such as studies by Ben-Eli et al.⁵ and Lundqvist et

al.,¹⁰ which found no significant gender-based differences in visual acuity improvement. The standardized technique used by a single surgeon in our study likely minimized variability, contributing to the uniform outcomes between genders. Nevertheless, certain baseline ocular characteristics-such as smaller average pupil size and greater nuclear sclerosis reported in women-could theoretically influence surgical difficulty and visual recovery. Although these parameters were not analyzed in our cohort, they may partly explain gender differences observed in other studies and warrant investigation in future research.

A significant reduction in IOP was a consistent finding, aligning with previous literature that attributes this effect to improved aqueous humor outflow after lens removal.^{11,12} The low complication rates (3.8% intraoperative, 1.6% postoperative) are comparable to those reported in large-scale studies and further underscore the procedure's safety.^{5,13} The absence of significant differences in complications between age and gender groups reinforces that phacoemulsification is a robust procedure for a diverse patient population.

The clinical implication of these findings is significant for patient counseling. Surgeons can confidently inform patients, regardless of their age (within the studied range) or gender, that they have a high probability of achieving excellent visual outcomes, provided there are no other underlying ocular diseases. This helps manage patient expectations and reinforces the reliability of phacoemulsification.

Limitations

This study has several limitations that must be acknowledged. First, its retrospective, single-center design inherently limits the generalizability of the findings. The results may not be applicable to settings with different patient demographics or surgical expertise. Second, the exclusion of patients with significant ocular or systemic comorbidities, while reducing confounding variables, also limits the external applicability of our findings to the general cataract population, which often presents with such conditions. Other limitations include the lack of analysis on gender-related baseline parameters like nuclear hardness or pupil size, and a follow-up period limited to 12 months; longer-term outcomes remain unassessed. These parameters could be relevant to gender differences, for example, smaller pupil size in women or variations in nuclear sclerosis. Future research should investigate these factors to provide a more comprehensive understanding of gender-specific outcomes. These limitations should be addressed in future research.

CONCLUSION

In this study, age and gender did not significantly affect postoperative visual acuity improvement, IOP changes, or complication rates following phacoemulsification surgery. Both younger (50-69 years) and older (≥ 70 years) patients, as well as male and female patients, demonstrated substantial and comparable improvements in visual outcomes. These findings suggest that phacoemulsification, when performed by an experienced surgeon, is a highly effective and safe procedure for a broad spectrum of cataract patients. Future research should include larger, multicenter prospective studies with more diverse patient cohorts, including those with comorbidities, to validate these results and provide a more comprehensive understanding of postoperative recovery.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of the Lokman Hekim University Scientific Researches Ethics Committee (Date: 30.05.2025, Decision No: 2025/153).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

REFERENCES

1. Saad Filho R, Moreto R, Nakaghi RO, Haddad W, Coelho RP, Messias A. Costs and outcomes of phacoemulsification for cataracts performed by residents. *Arq Bras Oftalmol*. 2020;83(3):209-214. doi:10.5935/0004-2749.20200059
2. Toyama T, Ueta T, Yoshitani M, Sakata R, Numaga J. Visual acuity improvement after phacoemulsification cataract surgery in patients aged ≥ 90 years. *BMC Ophthalmol*. 2018;18(1):280. doi:10.1186/s12886-018-0950-8
3. Lu Q, Wei L, He W, et al. Lens Opacities Classification System III-based artificial intelligence program for automatic cataract grading. *J Cataract Refract Surg*. 2022;48(5):528-534. doi:10.1097/j.jcrs.0000000000000790
4. Calkins DJ. Age-related changes in the visual pathways: blame it on the axon. *Invest Ophthalmol Vis Sci*. 2013;54(14):ORSF37-ORSF41. doi:10.1167/iovs.13-12784
5. Ben-Eli H, Cnaany Y, Halpert M, Chowers I, Goldstein A. Investigating the impact of age and sex on cataract surgery complications and outcomes. *Sci Rep*. 2025;15(1):1242. doi:10.1038/s41598-024-84382-4
6. Mönestam E, Wachmeister L. Impact of cataract surgery on the visual ability of the very old. *Am J Ophthalmol*. 2004;137(1):145-155. doi:10.1016/s0002-9394(03)00900-0
7. Marmamula S, Barrenakala NR, Challa R, et al. Visual outcomes after cataract surgery among the elderly residents in the 'homes for the aged' in South India: the Hyderabad ocular morbidity in elderly study. *Br J Ophthalmol*. 2021;105(8):1087-1093. doi:10.1136/bjophthalmol-2020-317167
8. Hashemi H, Mohammadi SF, Z-Mehrjardi H, et al. The role of demographic characteristics in the outcomes of cataract surgery and gender roles in the uptake of postoperative eye care: a hospital-based study. *Ophthalmic Epidemiol*. 2012;19(4):242-248. doi:10.3109/09286586.2012.691600
9. Quintana JM, Garcia S, Aguirre U, et al. Relationship of sociodemographic variables with outcomes after cataract surgery. *Eye (Lond)*. 2013;27(6):698-708. doi:10.1038/eye.2013.85
10. Lundqvist B, Mönestam E. Gender-related differences in cataract surgery outcome: a 5-year follow-up. *Acta Ophthalmol*. 2008;86(5):543-548. doi:10.1111/j.1600-0420.2007.01099.x
11. Hayashi K, Hayashi H, Nakao F, Hayashi F. Effect of cataract surgery on intraocular pressure control in glaucoma patients. *J Cataract Refract Surg*. 2001;27(11):1779-1786. doi:10.1016/s0886-3350(01)01036-7
12. Rothman AL, Chang TC, Lum F, Vanner EA. Intraocular pressure changes following stand-alone phacoemulsification: an IRIS-registry analysis. *Am J Ophthalmol*. 2023;245:25-36. doi:10.1016/j.ajo.2022.09.006
13. Kim BZ, Patel DV, McGhee CN. Auckland cataract study 2: clinical outcomes of phacoemulsification cataract surgery in a public teaching hospital. *Clin Exp Ophthalmol*. 2017;45(6):584-591. doi:10.1111/ceo.12922