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Research Article

Retrospective Analysis of One-Year Cataract Surgery Outcomes by a Single Surgeon and Comparison With Literature

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Abstract

Aim: The objective of this study was to retrospectively analyze the outcomes of cataract surgery performed by a single surgeon over a one-year period and compare these outcomes with those reported in the existing literature. This study aimed to assess the impact of factors such as age, comorbidities, and surgical technique on the postoperative results.

Material and Method: This retrospective study was conducted between March 2023 and March 2024, evaluating cataract surgeries performed by a single surgeon. Patients included in the study were aged 18 years and older and required cataract surgery due to various causes such as senile, mature, traumatic, or congenital cataracts. Preoperative evaluations included comprehensive systemic health screenings, biomicroscopic examination of both eyes, and measurement of intraocular pressure. Surgeries were performed using the phacoemulsification technique with intraocular lens implantation in all cases. Postoperative follow-ups were conducted on days 1, 7, 30, and 90 to assess visual acuity, intraocular pressure, and fundus examination.

Results: The study included 812 patients (mean age: 68.0 ± 10.0 years); 59.2% were female. Cataracts were present in 70.3% of right eyes and 82.0% of left eyes. Pseudophakia was observed in 25.1% and 15.0% of the right and left eyes, respectively. Postoperative complications were noted in 4.1% of patients, with a significant association between age and complication rate ($p = 0.049$). Sex differences in comorbidity prevalence were also statistically significant ($p < 0.001$).

Conclusion: This study demonstrated that cataract surgery performed by a single surgeon generally yields positive outcomes, with significant influences of age and comorbidities on surgical results. These findings are consistent with the existing literature and provide valuable insights into patient selection and surgical planning in cataract surgery.

Keywords: Cataract surgery, Comorbidities, Outcomes, Phacoemulsification

INTRODUCTION

Cataract surgery is a widely performed procedure that plays a crucial role in the prevention of blindness and restoration of vision (1). Over the decades, surgical techniques have evolved from intracapsular cataract extraction (ICCE) to extracapsular cataract extraction (ECCE); more recently, phacoemulsification has led to improved outcomes (2). The modern approach to cataract surgery focuses not only on visual rehabilitation but also on enhancing the overall quality of life through rapid recovery and minimal postoperative complications. Although surgical advancements have been significant, successful restoration of vision continues to depend on a variety of factors, including the surgeon's proficiency (3).

CITATION

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The effectiveness of cataract surgery can be influenced by various factors related to both the patient and surgical technique. Factors such as patient age, ocular comorbidities, and preoperative visual acuity play important roles in determining outcomes (4). Additionally, the surgical technique, including the choice of incision, type of intraocular lens (IOL) implantation, and management of intraoperative challenges, contributes to the overall success of surgery (5). The ongoing development of surgical techniques and technologies underscores the need for continuous evaluation of their impact on patient outcomes.

Understanding the impact of these factors requires a detailed examination of the surgical outcomes. Analyzing data from surgeries performed by a single surgeon offers a unique opportunity to isolate the effects of surgical techniques and decision-making on postoperative results (6). This approach helps minimize variables and allows for a more focused investigation into how surgical proficiency and consistency affect patient outcomes (7). By evaluating the results of surgeries conducted by a single surgeon, this study aimed to provide insights into the direct influence of surgical expertise on the success of cataract surgeries.

The objective of this study was to conduct a retrospective analysis of cataract surgery outcomes performed by a single surgeon, compare these results with those reported in the literature, and thereby provide a clearer understanding of how individual surgical practices contribute to overall patient care.

MATERIAL AND METHOD

This retrospective study was conducted between March 2023 and March 2024 to evaluate cataract surgeries performed by a single surgeon. This study was initiated after obtaining ethical approval in accordance with the Declaration of Helsinki. Ethical approval for this study was obtained under decision number GOKAEK 2024/17/1 (decision date:25.09.2024), issued by the Non-Interventional Clinical Research Ethics Committee of Samsun University.

All patients underwent surgery according to the standard protocols set by the surgeon, and their postoperative follow-up processes were retrospectively reviewed. All surgeries in this study were performed by a single surgeon (Ş.K.), who had 10 years of experience in ophthalmic surgery at the beginning of the study period. Ş.K. routinely performs cataract surgery, including phacoemulsification and other advanced anterior segment procedures.

Patient Selection

The patients included in the study were those aged 18 years and older who required cataract surgery due to various conditions, such as senile cataract, mature cataract, traumatic cataract, or congenital cataract.

During the preoperative period, all patients underwent routine systemic health screening, including hemogram, biochemistry, electrocardiography, and chest radiography. Patients who received anesthesia clearance were selected for surgery.

The inclusion criteria were complete preoperative evaluation, a minimum follow-up period of 6 months, and surgeries performed by a single surgeon. Patients with incomplete data or an insufficient follow-up duration were excluded from the study.

Cataract surgery could not be performed in some patients due to reasons such as advanced systemic disease (e.g., uncontrolled hypertension or recent myocardial infarction), severe ocular comorbidities (e.g., end-stage glaucoma, phthisis bulbi), poor general condition, or refusal to undergo surgery. These patients were classified as inoperable and excluded from further surgical analysis.

Preoperative Assessment

During the preoperative assessment, demographic information such as the patient's age, sex, and the eye to be operated on (right/left) was recorded. Biomicroscopic examination was performed on both eyes to assess the type of cataract (e.g., immature cataract, mature cataract, traumatic cataract), presence of corneal scarring, corneal dystrophies, history of uveitis, synechiae, and pseudoexfoliation syndrome (PEX). Cataracts were graded from grade 1 to grade 4.

For patients with a preoperative intraocular pressure (IOP) > 30 mmHg, pre-surgical antiglaucoma medication was administered, and mannitol was used if necessary to lower the IOP before surgery.

Patients with blepharitis underwent preoperative treatment with topical antibiotic drops (moxifloxacin 0.5% or tobramycin 0.3%, four times daily for at least 7 days) and lid hygiene. For those with nasolacrimal duct obstruction, probing or dacryocystorhinostomy (DCR) was performed as indicated, followed by topical antibiotics.

Postoperatively, all patients received intracameral cefuroxime (1 mg/0.1 mL) at the end of surgery as standard prophylaxis against endophthalmitis. Patients diagnosed with uveitis were only included in the surgery group after completing uveitis treatment and maintaining remission for at least six months.

Surgical Procedure

Cataract surgery was performed using the phacoemulsification technique in all patients. Preoperative anesthesia was administered as retrobulbar or peribulbar. The patients were monitored in the operating room before surgery.

The standard surgical procedure involved creating a corneal incision aligned with the steep axis, followed by cataract removal using the phacoemulsification technique. In cases in which iris or capsular issues were encountered, additional surgical maneuvers were performed. Intraocular lens implantation was performed during surgery, and the lens power was determined based on preoperative biometric measurements.

Only one eye was operated on per session, except in two cases involving patients with psychiatric conditions requiring general anesthesia, in which both eyes were operated on in the same session to avoid repeated anesthesia. Additionally, for patients with anxiety or panic attacks, dorsal support was provided during anesthesia.

Postoperative Follow-Up and Evaluation

During the postoperative follow-up period, patients were assessed on the first day, first week, first month, and third month after surgery. During these follow-ups, visual acuity, intraocular pressure, and fundus examination results were thoroughly evaluated and recorded. Patients who required postoperative corrective glasses were provided with a prescription after the first month. All patients received topical moxifloxacin 0.5% and prednisolone acetate 1% eye drops, which were administered hourly on the first day and five times daily for the following three weeks.

Statistical Analysis

Data analysis was conducted using SPSS software (Version 27, SPSS Inc., Chicago, IL, USA). To assess distribution normality, Kolmogorov–Smirnov and Shapiro–Wilk tests were used along with histogram evaluations. An independent samples t-test was used for variables with a normal distribution. For non-normally distributed data, the Mann–Whitney U test was applied. Statistical significance was set at $p < 0.05$.

RESULTS

The average age of the cataract patients included in the study was 68.0 ± 10.0 years. Among the participants, 59.2% were female, corresponding to 481 individuals. The right eye was operated on in 49.8% of patients, with a total of 404 individuals. Biomicroscopic examination of the right eye revealed that 70.3% of the patients (571 individuals) had cataracts, 25.1% (204 individuals) were pseudophakic, 3.4% (28 individuals) had mature cataracts, 0.7% (6 individuals) were inoperable, and 0.4% (3 individuals) had traumatic cataracts. In the left eye, biomicroscopic findings showed that 82.0% of the patients (666 individuals) had cataracts, 15.0% (122 individuals) were pseudophakic, 2.2% (18 individuals) had mature cataracts, 0.6% (5 individuals) were inoperable, and 0.1% (1 individual) had traumatic cataracts. Corneal scarring was observed in 1.1% of the right eyes (9 individuals) and 0.7% of the left eyes (6 individuals). PEX was present in 10.3% of the patients, accounting for 84 individuals. Amblyopia was noted in 0.6% of the right eyes (5 individuals) and 1.0% of the left eyes (8 individuals) (Table 1).

Table 1. Demographic and clinical characteristics of patients

Variables	mean ± SD or n (%)
Age (year)	68.0±10.0
Gender (Female)	481 (59.2)
Opereted Eye (Right)	404 (49.8)
Right Biomicroscope	
Inoperable	6 (0.7)
Cataract	571 (70.3)
Pseudophakic	204 (25.1)
Mature Cataract	28 (3.4)
Traumatic Cataract	3 (0.4)
Left Biomicroscope	
Inoperable	5 (0.6)
Cataract	666 (82.0)
Pseudophakic	122 (15.0)
Mature Cataract	18 (2.2)
Traumatic Cataract	1 (0.1)
Right Corneal Scar	9 (1.1)
Left Corneal Scar	6 (0.7)
PEX	84 (10.3)
Right Amlyopia	5 (0.6)
Left Amlyopia	8 (1.0)

Nasolacrimal duct obstruction was identified in 0.2% of the patients (2 individuals). Glaucoma was present in 3.1% of patients (25 individuals). Retinitis pigmentosa was observed in 0.5% of patients (4 individuals). Uveitis was found in 0.4% of patients (3 individuals). A choroidal neovascular membrane (CNVM) was detected in 0.9% of the patients (7 individuals). Strabismus was noted in 0.4% of the patients (3 individuals). Corneal dystrophy was present in 0.2% of patients (2 individuals). Lamellar macular hole was a rare finding, observed in 0.1% of the patients (1 individual). Regarding right fundus signs, 3.4% of the patients (28 individuals) had unclassified findings, 85.3% (693 individuals) had a normal fundus, 1.4% (11 individuals) had macular edema, 5.7% (46 individuals) had drusen, 2.0% (16 individuals) had an epiretinal membrane, 0.5% (4 individuals) had vitreomacular traction, and 1.7% (14 individuals) had macular scars/atrophy. Regarding the left fundus signs, 3.0% of the patients (24 individuals) had unclassified findings, 85.6% (694 individuals) had a normal fundus, 2.1% (17 individuals) had macular edema, 5.5% (45 individuals) had drusen, 2.1% (17 individuals) had an epiretinal membrane, 0.1% (1 individual) had vitreomacular traction, and 1.6% (13 individuals) had macular scars/atrophy (Table 2).

Table 2. Ocular comorbidities and fundus findings

Variables	N	%
Nasolacrimal Duct Obstruction	2	0.2
Glaucoma	25	3.1
Retinitis Pigmentosa	4	0.5
Uveitis	3	0.4
CNVM	7	0.9
Strabismus	3	0.4
Corneal Dystrophy	2	0.2
Lamellar Macular Hole	1	0.1
Right Fundus Sign		
Unselected	28	3.4
Normal	693	85.3
Macula Eudema	11	1.4
Drusen	46	5.7
Epiretinal Membrane	16	2.0
Vitreomacular Traction	4	0.5
Macula Scar/Atrophy	14	1.7
Left Fundus Sign		
Unselected	24	3.0
Normal	694	85.6
Macula Eudema	17	2.1
Drusen	45	5.5
Epiretinal Membrane	17	2.1
Vitreomacular Traction	1	0.1
Macula Scar/Atrophy	13	1.6

The mean intraocular pressure was measured as 16.8 ± 3.0 mmHg in the right eye and 17.2 ± 3.3 mmHg in the left eye. The mean macular thickness was 246.0 ± 33.7 microns in the right eye and 250.3 ± 31.1 microns in the left eye. The mean axial length was 23.1 ± 1.0 mm in the right eye and 23.1 ± 1.2 mm in the left eye. The mean anterior chamber depth was 3.1 ± 0.4 mm in both the right and left eyes. The mean lens diopter was 22.3 ± 2.7 for the right eye and 22.3 ± 2.6 for the left eye (Table 3).

Table 3. Ocular biometric measurements

Variables	Mean ± SD
Right Intraocular Pressure (mmHg)	16.8±3.0
Left Intraocular Pressure (mmHg)	17.2±3.3
Right Macular Thickness (micron)	246.0±33.7
Left Macular Thickness (micron)	250.3±31.1
Right Axial Length (mm)	23.1±1.0
Left Axial Length (mm)	23.1±1.2
Right Anterior Chamber Depth (mm)	3.1±0.4
Left Anterior Chamber Depth (mm)	3.1±0.4
Right Lens Diopter	22.3±2.7
Left Lens Diopter	22.3±2.6

Among the patients, 65.1% (529 individuals) had comorbidities, while 34.9% (283) did not. Regarding complications, 4.1% of patients (33 individuals) experienced complications, whereas 95.9% (n = 779) did not encounter any complications. The distribution of complications was as follows: posterior capsule rupture was observed in 0.9% (n = 7), zonular dialysis or defect requiring a capsular tension ring in 1.5% (n = 12), iris prolapse in 0.7% (n = 6), vitreous prolapse in 0.5% (n = 4), corneal burn or need for corneal suturing in 0.4% (n = 3), aphakia or incorrect intraocular lens implantation in 0.2% (n = 2), and iris bleeding in 0.1% (n = 1). Other minor complications, such as inability to obtain fundus reflex, poor patient compliance, high vitreous pressure, or panic attack, were recorded in 0.4% of the patients (n = 3) (Table 4).

Table 4. Prevalence of comorbidities and complications among patients

Variables	N	%
Comorbidity		
No	283	34.9
Yes	529	65.1
Complications		
No	779	95.9
Yes	33	4.1

Table 5 displays the association between age and the outcome variable. The coefficient for age was 0.0372 with a standard error of 0.019, resulting in a z-value of 1.965. The p-value associated with this finding was 0.049, indicating statistical significance at the 0.05 level. The 95% confidence interval for the coefficient ranged from 0.01 to 0.074. The overall complication rate in our study was 4.1%.

Table 5. Association between age and complications of surgery

	Coefficient	Standard Error	z-value	p value	95% CI
Age	0.037	0.019	1.96	0.049	0.01 - 0.074

The prevalence of comorbidities among female and male patients is compared. The data showed that 70.9% of the female patients (341 individuals) had comorbidities, while 29.1% (140 individuals) did not. Among the male patients, 56.8% (188 individuals) had comorbidities, and 43.2% (143 individuals) did not. The p-value for the comparison between sexes was less than 0.001, indicating that the difference in comorbidity prevalence between females and males was statistically significant (Table 6).

Table 6. Gender differences in comorbidity prevalence

		Female		Male		
		N	%	N	%	p
Comorbidity	No	140	29.1	143	43.2	<0.001
	Yes	341	70.9	188	56.8	

In the multivariate logistic regression analysis, including age, sex, comorbidity, operated eye, presence of PEX, macular thickness group, intraocular pressure, macular thickness, axial length, anterior chamber depth, and lens diopter, no variable was found to be an independent predictor for the development of complications (all p > 0.05) (Table 7).

Table 7. Results of multivariate logistic regression analysis for predictors of intraoperative and postoperative complications

	B	p	Exp (B)	95% C.I. for	
				Lower	Upper
Age (year)	0.007	0.856	1.007	0.934	1.086
Gender (male)	-0.271	0.685	0.762	0.206	2.827
Comorbidity	-0.089	0.898	0.915	0.236	3.554
Opereted Eye (Right)	0.380	0.581	1.463	0.379	5.639
PEX	0.236	0.837	1.266	0.133	12.018
Right Macular Thickness > 300	-0.912	0.608	0.402	0.012	13.115
Left MAcular Thickness Group > 300	17.728	0.998	5.01	0.001	.
Right Intraocular Pressure (mmHg)	0.089	0.629	1.093	0.762	1.568
Left Intraocular Pressure (mmHg)	-0.212	0.276	0.809	0.552	1.185
Right Macular Thickness (micron)	0.004	0.754	1.004	0.981	1.026
Left Macular Thickness (micron)	-0.001	0.913	0.999	0.972	1.025
Right Axial Length (mm)	1.726	0.081	5.620	0.809	39.033
Left Axial Length (mm)	-1.292	0.214	0.275	0.036	2.112
Right Anterior Chamber Depth (mm)	-0.786	0.707	0.455	0.008	27.601
Left Anterior Chamber Depth (mm)	0.160	0.938	1.174	0.020	67.259
Right Lens Diopter	0.217	0.182	1.242	0.903	1.707
Left Lens Diopter	-0.089	0.717	0.915	0.566	1.480
Constant	-30.606	0.997	0.001		

DISCUSSION

In this study, the prevalence of comorbidities, sex differences, and the impact of age on surgical outcomes among patients who underwent cataract surgery were found to be statistically significant. A notable difference in the prevalence of comorbidities was observed between male and female patients, highlighting the potential impact of sex on health status and surgical outcomes. The effect of age on surgical outcomes also emerged as a significant finding, with an increased risk of surgical complications in older patients. These findings are consistent with the existing literature and provide new and valuable insights into the factors that affect surgical outcomes. Emphasis on the impact of age and comorbidities on surgical outcomes suggests that greater care should be taken in preoperative risk assessments. The logical explanation for our findings is that advanced age and the presence of comorbidities increase the risk of postoperative complications. This can be explained by the weakening of bodily functions with age and the negative impact of comorbidities on surgical recovery. Our study contributes significantly to the literature on patient selection and management strategies for cataract surgery by emphasizing these findings.

Sommer et al. conducted a retrospective study to evaluate changes in the medical and demographic characteristics of patients presenting for cataract surgery over a 15-year

period (8). They observed a significant increase in the average age of the patients and a substantial increase in the frequency of systemic comorbidities. Notably, there has also been an increase in the frequency of ocular factors that could lead to surgical challenges, such as diabetes and narrow palpebral fissures. Additionally, an increase in the prevalence of glaucoma was noted; however, this increase was not statistically significant. In our study, the average age of the patients was found to be high, in agreement with the findings of Sommer et al. Similarly, the prevalence of comorbidities in our study was high, and this prevalence was more pronounced in female patients. However, in our study, the prevalence of glaucoma was 3.1%, which is lower than that reported by Sommer et al. Furthermore, unlike the study by Sommer et al., the prevalence of pseudoexfoliation syndrome in our study was 10.3%. These findings support the notion that ocular factors leading to surgical challenges have increased over time and emphasize the potential impact of these factors on surgical outcomes.

Doyle et al. conducted a retrospective study examining the outcomes of cataract surgery in patients with vision loss in only one eye. In this study, 918 patients were evaluated, and the surgical complication rate was 4.0% (9). The posterior capsule rupture (PCR) rate was 1.9%. Postoperatively, 72.5% of patients achieved a visual acuity of 0.30 LogMAR or better. These findings emphasize the risks and potential benefits of cataract surgery in patients with vision loss in only one eye. In our study, surgical complications were observed in 4.1% of the patients, a rate similar to that reported by Doyle et al. However, the PCR rate in the present study was < 0.7%. In terms of visual acuity, as in the study by Doyle et al., the majority of our patients experienced significant improvement in postoperative visual acuity. Our study highlights that the outcomes of cataract surgery in patients with vision impairment in only one eye share similar risks and benefits as those reported in the literature, contributing valuable insights to the field.

In our findings, the mean age of patients undergoing cataract surgery was 68.0 ± 10.0 years, which is similar to the 69.7 ± 10.7 years reported in the retrospective nationwide study by Feng et al. from China (10). The proportion of female patients was comparable in both studies (59.2% in our study vs. 58% in Feng et al.). The complication rate in our cohort was 4.1%, whereas Feng et al. reported a rate of 3.5% on postoperative day 3. This minor difference may be attributed to variations in surgical expertise between centers, differences in case complexity, and discrepancies in the follow-up duration. Another critical factor influencing cataract surgery complication rates is the experience of the surgeon and/or the supervisor. In a retrospective analysis by Puri et al., the complication rate during phacoemulsification procedures performed by residents was significantly higher (28%) under the supervision of novice instructors in the early period; however, this rate decreased markedly to 6.7% as experience increased (11). The most frequent complications were vitreous loss and anterior capsule rupture, both of which occurred at significantly lower rates under experienced supervision. Similarly, in a retrospective analysis by Sonron et al. (2015) involving 401 patients in Trinidad and Tobago, the mean age was reported as 68.1 years and the female proportion was 50%, both of which are consistent with the demographics in our study (12). Sonron et al. reported that the prevalence of comorbidities was also high, with diabetes mellitus observed in 41% and hypertension in 45% of the patients, whereas in our series, the overall comorbidity rate was 65.1%. In both studies, phacoemulsification was the main surgical technique employed, and the risk of poor outcomes significantly increased in patients undergoing ECCE. Sonron et al. identified ocular comorbidity in 32% of patients, which nearly doubled the risk of complications (OR = 2.13).

The findings obtained in our study show significant parallels and some differences when compared to similar studies in the literature. Specifically, studies on cataract surgery outcomes in elderly patients have emphasized that surgical outcomes may vary depending on age. For instance, in a study by Wong et al., surgical outcomes in patients over 85 years of age were worse than those in younger patients, with visual acuity remaining at lower levels in this age group (13). Similarly, in a meta-analysis by Davis et al., the risk of postoperative complications increased in elderly patients, and postoperative recovery took longer (14). In our study, it was also observed that the surgical complication rate was higher among elderly patients, presenting a finding consistent with the literature. Additionally, in the study by Wagemans et al., it was stated that cataract surgery is generally successful in elderly patients, but the risk of complications increases with age (15). Specifically, in the advanced age group, achieving postoperative visual acuity and the associated improvement in quality of life were limited. These findings align with those of our study and emphasize the importance of considering age in the surgical planning process.

Finally, a published study reported that significant improvement in visual acuity was observed in patients over 80 years of age following surgery, but this improvement was less pronounced in patients over 90 years of age (16). A similar finding was obtained in our study; while surgical outcomes were generally favorable in our elderly patients, visual improvement was more limited compared to younger patients. This limitation can be attributed to age-related structural and functional changes in the retina and optic nerve, as well as a higher prevalence of ocular comorbidities such as age-related macular degeneration and diabetic retinopathy in older individuals. Furthermore, advanced age was associated with an increased risk of postoperative complications—including posterior capsule rupture, zonular dehiscence, iris or vitreous prolapse, and cystoid macular edema—and a slower postoperative recovery process, as widely documented in the literature (17, 18). These factors may explain the less pronounced visual gain and higher complication rates observed in our elderly patients.

This study had several limitations. First, as a retrospective study, there is the potential for incomplete or inaccurate data collection, which may affect the overall reliability of the findings. This study was conducted by a single surgeon,

which could limit the generalizability of the results across different surgical practices. Furthermore, the follow-up period in our study was limited to three months. Therefore, late-onset complications such as posterior capsule opacification (PCO) may not have been detected or adequately evaluated. This limited follow-up duration represents an important methodological limitation, particularly in the context of assessing complications that typically develop after the early postoperative period. Finally, the study population was restricted to a specific geographic region, limiting the ability to compare results with those from diverse demographic and geographic backgrounds.

CONCLUSION

This study demonstrated that cataract surgery generally yields positive outcomes, although age and comorbidities had a significant impact on surgical results. The increased risk of postoperative complications in elderly patients underscores the importance of thorough preoperative assessment. Despite being conducted by a single surgeon, the findings align with those reported in the broader literature and provide valuable insights into cataract surgery practices. Future studies involving multiple surgeons and larger, more diverse populations could enhance the generalizability of these findings. Additionally, long-term follow-up data would be beneficial for evaluating the durability of surgical outcomes and the development of late-onset complications.

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