Original Article

Predictive Factors of Complications and Visual Outcomes after Pediatric Cataract Surgery: A Single Referral Center Study from Türkiye

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Abstract

Objectives: To evaluate the predictive factors of complications and visual acuity outcomes in pediatric cataract patients.

Materials and Methods: This retrospective, observational clinical study included 80 eyes of 50 patients treated for pediatric cataracts between 2010 and 2020. The eyes were divided into Group I (congenital cataracts, n=38) and Group II (developmental cataracts, n=42). Group II was also divided into Group IIA (aphakic, n=21) and Group IIB (pseudophakic, n=21). The effects of the age, laterality, cataract morphology, intraocular lens implantation, preoperative nystagmus/strabismus, and intraoperative anterior hyaloid rupture on complications and final best-corrected visual acuity (BCVA; logMAR) were evaluated.

Results: The median (interquartile range) age and follow-up time were 28 (5-79) months and 60 (29-84) months, respectively. There was a significant difference in mean final BCVA between Group I (0.79±0.46) and Group II (0.57±0.51) (p=0.047); however, no difference was observed between Group IIA and Group IIB (p=0.541). Having congenital cataract (p=0.045), preoperative nystagmus/strabismus (p=0.042), total/mature cataract (p<0.001), and postoperative complications (p=0.07) were significantly associated with final BCVA. However, in multivariate analysis, only total/mature cataract (β: 0.52, p<0.001) and having any complication (β: 0.24, p=0.018) were associated with final BCVA. Congenital cataract and intraoperative anterior hyaloid rupture were the only significant risk factors of postoperative complications on univariate (p=0.027 and p=0.003, respectively) and binary logistic regression analysis (odds ratio [OR]: 2.95 [95% confidence interval: 1.07-8.15], p=0.036 and OR: 4.28 [95% confidence interval: 1.55-11.77], p=0.005, respectively).

Conclusion: Total/mature cataract and the presence of any postoperative complication adversely affected the final BCVA. Having a congenital cataract and intraoperative anterior hyaloid membrane rupture increased the risk of complications.

Keywords: Pediatric cataract, congenital cataract, developmental cataract, surgery, complication, visual outcomes

Introduction

The factors affecting the long-term outcomes of congenital and developmental pediatric cataracts are frequently studied in the literature, with the most commonly investigated parameters being age at surgery, bilaterality, and intraocular lens (IOL) implantation.[1,2,3] Although congenital and unilateral cataracts were generally accepted as affecting visual outcomes, recent long-term studies with IOL implantation and aphakic treatment resulted in comparable success rates in final visual acuity.[1,2,3] However, it is difficult to make prospective observations or definite conclusions about all factors influencing final visual acuity, such as cataract morphology, preoperative nystagmus or strabismus, and occlusion therapy compliance.

The most common complications after pediatric cataract surgeries are inflammatory reactions in the anterior chamber and visual axis opacifications (VAO), and one of the most severe complications is secondary glaucoma.[4,5,6,7] As complications after pediatric cataract surgeries result in worse visual outcomes, it is essential to recognize and manage the factors associated with complication development.[1,8] For this purpose, the most commonly investigated parameters are age at diagnosis, anterior vitrectomy, IOL implantation, and techniques of IOL implantation.[9,10,11,12,13,14]

The present study aimed to evaluate the effects of age at diagnosis, laterality, cataract morphology, preoperative nystagmus or strabismus, IOL implantation, and unintentional intraoperative anterior hyaloid rupture on complication rates

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and best-corrected visual acuities (BCVA) after pediatric cataract surgeries.

Materials and Methods

Study Design and Patients

This single-center, retrospective, observational study included congenital and developmental pediatric cataract patients who presented to the Pediatric Ophthalmology and Strabismus Unit of the Department of Ophthalmology at Marmara University Faculty of Medicine Hospital in Pendik, İstanbul between January 2010 and January 2020. The Institutional Review Board of Marmara University Faculty of Medicine approved the study protocol (decision no: 09.2020.1169, date: 06.11.2020), and the study was conducted following the principles of the Declaration of Helsinki. All patients' legal guardians routinely provided written informed consent about using their medical information in the study analysis at their first presentation and before the individual interventions.

The records of patients diagnosed with congenital and developmental cataracts were retrospectively reviewed, and eligible patients were included in the study. The exclusion criteria were: traumatic or uveitic cataracts, not having undergone cataract surgery, having cataract surgery at another center, having ocular comorbidities, having a secondary IOL implantation, lack of consistent or adequate medical records, having a follow-up time <1 year, and inability to obtain final visual acuity. Demographic and clinical characteristics of the patients such as sex, laterality (unilateral or bilateral), cataract morphology (lamellar-cortical, total/mature, posterior polar, posterior subcapsular, anterior polar, nuclear, and oil drop), age at diagnosis (months), age at surgery (months), time from diagnosis to surgery (months), and follow-up time (months) were recorded.

Surgical Indication and Technique

All patients underwent a comprehensive preoperative ophthalmologic examination including evaluation of best-corrected visual acuity (BCVA) with the HOTV, Snellen, or Tumbling "E" charts if possible, intraocular pressure (IOP) with TONO-PEN XL (Hagg-Streit, Koeniz, Switzerland) or Goldmann applanation tonometry depending on the patient's age, dilated fundus examination, retinoscopy with cycloplegia, keratometry, and B-scan ultrasonography if indicated. Any visually significant cataracts with a risk of deprivation amblyopia were considered an indication for cataract surgery.

All surgeries were performed under general anesthesia by the same experienced surgeon (E.Ç.). Two side port incisions were made at 2 and 10 clock hours, and the anterior chamber was filled with a cohesive ophthalmic viscoelastic device (OVD). A 5- to 5.5-mm anterior continuous curvilinear capsulorhexis (CCC) was made with micro-forceps. Then, lenticular material was aspirated by bimanual irrigation/aspiration. After clearance of the lenticular material, a small incision was made at the posterior capsule with a cystotomy cannula. Next, the Berger space was filled with dispersive OVD to prevent anterior hyaloid membrane rupture, and posterior CCC was completed with micro-forceps. Finally, a 23-gauge anterior vitrectomy was performed if the anterior hyaloid was ruptured unintentionally during the surgery with any vitreous prolapse into the anterior chamber.

A three-piece hydrophobic acrylic IOL was implanted in the capsular bag or sulcus through a 2.4-mm main incision as primary IOL implantation only if the patient was over 12 months old and the caregivers thought that using contact lenses or glasses would be problematic due to socio-economic difficulties. Otherwise, the patients were left aphakic.

All incisions were then sutured with 10-0 nylon or vicryl sutures. Postoperative therapy included topical moxifloxacin hydrochloride (Vigamox 0.5%, Alcon Laboratories, Inc., Texas, USA) and prednisolone acetate (Pred-forte 1%, Allergan Pharmaceutical, Westport/Co. Mayo, Ireland) four times a day for one month.

Postoperative Complications and Visual Acuity

Follow-up examinations were performed at 1 day, 1 week, 1 month, and 3 months after the surgery and then at intervals of 3 to 6 months. All follow-up visits included BCVA assessment (if possible), IOP measurement, slit-lamp biomicroscopy, retinoscopy, and dilated fundus examinations. The patients' final BCVA in decimal or Snellen values were converted to the logarithm of the minimum angle of resolution (logMAR) for statistical analysis. The appropriate contact lens corrections for the aphakic patients and spectacle corrections for the pseudophakic patients were prescribed at postoperative 1 week and monitored by regular retinoscopy at 3- to 6-month intervals. In addition, occlusion therapy was applied for all unilateral cases and the bilateral cases with significant anisometropia.

Postoperative complications noted were as follows: posterior synechia (defined as an adhesion between the iris and IOL or IOL capsule preventing iris dilation), VAO (capsular or anterior vitreous opacification obscuring retinal examination), fibrinous membrane (a membrane covering the pupil), IOP spike (an elevation in IOP within the first postoperative week requiring medication), and secondary glaucoma (determined according to The British Infantile and Childhood Glaucoma Eye Study criteria).[15] A second surgery was performed in patients with any complication obscuring the visual axis that can cause amblyopia and in secondary glaucoma unresponsive to medical treatment.

The possible predictive factors for postoperative complications and final BCVA were determined as age at surgery, laterality (unilateral or bilateral), IOL implantation, cataract morphology, preoperative nystagmus or strabismus, and unintentional intraoperative anterior hyaloid rupture.

To better present the effects of age and intraoperative IOL implantation on complication rates and final BCVA, the eyes were divided according to the patient's age at diagnosis and treatment into Group I (≤12 months; congenital cataracts) and Group II (>12 months; developmental cataracts). In addition, Group II was divided according to intraoperative IOL implantation into Group IIA (aphakic) and Group IIB (pseudophakic) subgroups.

Statistical Analysis

SPSS for Macintosh version 24.0 (IBM Corp., Armonk, NY, USA) was used to analyze the data. Data distributions were assessed with the Kolmogorov-Smirnov test and histogram graphs; descriptive data were presented as the median and interquartile range (IQR). However, despite a non-parametric distribution, BCVA values were given as mean ± standard deviation for better presentation of the data. Pearson's chi-square test and Bonferroni correction were used to compare categorical variables for two- or three-group comparisons. Cramer's V and point-biserial correlation tests were used to evaluate categorical-categorical and categorical-numerical correlations, respectively. Independent samples with two or more groups were compared with the Mann-Whitney U or Kruskal-Wallis test, respectively. Pairwise comparisons were used for post-hoc tests. A linear regression analysis, including variables significant at the 0.1 level in univariate analysis, was employed to evaluate the most effective predictive factors for BCVA. For factors correlated at the level of 0.4 or higher, only the most significantly affected one was included in the regression analysis. Cohen's d and phi coefficient tests were used to determine the effect size for continuous and categorical data, respectively. A chi-square test was performed for univariate analysis of risk factors for complication development. Risk factors that were determined to be significant in these analyses were also evaluated by binary logistic regression analysis. Odds ratios (OR) and 95% confidence intervals (CI) were assessed to identify independent risk factors. A p value less than 0.05 was considered statistically significant.

Results

There were 99 patients (161 eyes) with pediatric cataracts during the study period. After excluding the non-eligible patients, 50 patients (80 eyes) were included in the study analysis (Figure 1). Of them, 22 patients (38 eyes) were diagnosed with congenital cataracts before the age of 12 months, underwent cataract extraction without IOL implantation, and received contact lenses for refractive correction (Group I). The other 28 patients (42 eyes) were diagnosed with developmental cataracts after the age of 12 months and treated with cataract extraction (Group II). Among the patients in Group II, 14 patients (21 eyes) were left aphakic and treated with contact lens correction (Group IIA), and 14 patients (21 eyes) had primary IOL implantation during the cataract surgery (Group IIB). The overall median follow-up time was 60 (IQR: 29-84) months. The demographical and clinical data of the groups are presented in Table 1.

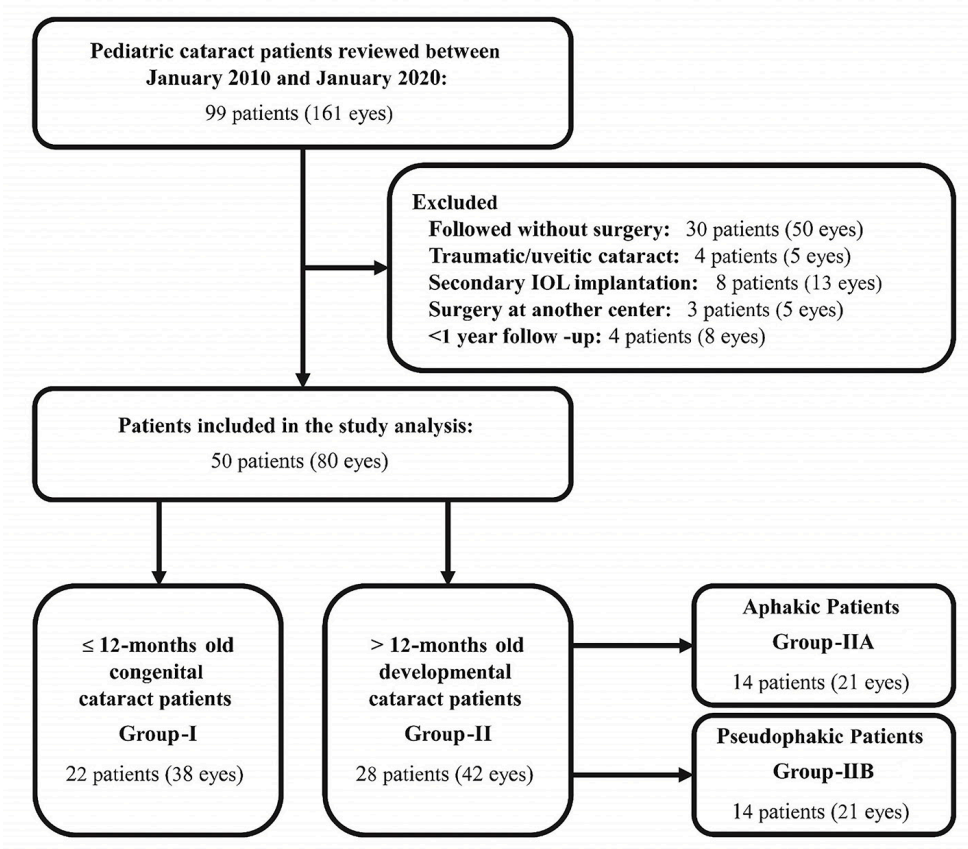

Figure 1. The flowchart of study enrollment
IOL: Intraocular lens

Table 1. Demographic and clinical characteristics of the patients

	Group I n=22 (38 eyes)	Group II			p values		
		Group II total n=28 (42 eyes)	Group IIA n=14 (21 eyes)	Group IIB n=14 (21 eyes)	p_1[a]	p_2[b]	Post-hoc test[c]
Sex, n (eyes) Female Male	 13 (20) 9 (18)	 12 (16) 16 (26)	 7 (11) 7 (10)	 5 (5) 9 (16)	0.192	0.076	NA
Age at diagnosis, months Median (IQR)	4 (2-5)	62 (36-80)	52 (43-72)	76 (32-94)	<0.001*	<0.001*	Group I vs. IIA, p<0.001* Group I vs. IIB, p<0.001*
Age at surgery, months Median (IQR)	5 (3-8)	74 (49-85)	52 (52-76)	80 (32-102)	<0.001*	<0.001*	Group I vs. IIA, p<0.001* Group I vs. IIB, p<0.001*
Time to surgery, months Median (IQR)	0.5 (0-2.5)	5 (0-12)	4 (0-6)	4 (0-12)	0.012*	0.020*	Group I vs. IIB, p=0.017*
Follow-up, months Median (IQR)	68 (46-102)	42 (18-72)	24 (12-54)	60 (32-93)	<0.001*	<0.001*	Group I vs. IIA, p<0.001* Group IIA vs. IIB, p=0.004*
Laterality, eyes (%) Bilateral Unilateral	 32 (84.2) 6 (15.8)	 28 (66.7) 14 (33.3)	 14 (66.7) 7 (33.3)	 14 (66.7) 7 (33.3)	0.123	0.194	NA
Cataract morphology, eyes (%) Lamellar-cortical Total/mature Posterior polar Posterior subcapsular Anterior polar Nuclear Oil drop	 12 (31.6) 12 (31.6) 9 (23.7) 2 (5.3) 2 (5.3) 0 (0.0) 1 (2.6)	 9 (21.4) 8 (19) 9 (21.4) 7 (16.7) 3 (7.1) 4 (9.5) 2 (4.8)	 0 (0.0) 6 (28.6) 5 (23.8) 3 (14.3) 3 (14.3) 2 (9.5) 2 (9.5)	 9 (42.9) 2 (9.5) 4 (19) 4 (19) 0 (0.0) 2 (9.5) 0 (0.0)	NA	NA	NA
Preoperative nystagmus or strabismus, eyes (%)	21 (65.8)	12 (28.6)	4 (19)	8 (38.1)	0.015*	0.024*	Group I vs. IIA, p=0.021*
Intraoperative anterior hyaloid rupture, eyes (%)	16 (42.1)	15 (35.7)	9 (42.9)	6 (28.6)	0.558	0.072	NA
Presence of any complication, eyes (%)	18 (47.4)	10 (23.8)	4 (19)	6 (28.6)	0.027*	0.071	NA
Final BCVA, logMAR Mean ± SD	0.79±0.46	0.57±0.51	0.65±0.59	0.49±0.40	0.020*	0.051	NA

p_1: Group I vs. II, p_2: Group I vs. IIA vs. IIB, [a]Mann-Whitney U test and chi-square test were used for continuous and categorical p_1 values, respectively, [b]Kruskal-Wallis test and chi-square test were used for continuous and categorical p_2 values, respectively. [c]Statistically significant p-values obtained from Kruskal-Wallis pairwise comparisons and chi-square test with Bonferroni correction for continuous and categorical variables, respectively. *Statistically significant.
BCVA: Best-corrected visual acuity, IQR: Interquartile range, logMAR: Logarithm of the minimum angle of resolution, NA: Not applicable, SD: Standard deviation

Final Visual Acuity

The final BCVA of Group II was significantly better than that of Group I (0.57±0.5 vs. 0.79±0.5 logMAR, p=0.020, Cohen's d=0.48). However, there was no significant difference in three-group comparisons (p=0.051).

Considering the predictive factors of final BCVA, a slight negative correlation was found between final BCVA and age at surgery (r=-0.280, p=0.012). The median age at diagnosis was significantly higher in unilateral cases (37 months, IQR: 7-75 months) than bilateral cases (9 months, IQR: 3-52 months) (p=0.035). However, there was no significant difference between unilateral and bilateral cases in terms of time from diagnosis to surgery (1.5 months, IQR: 0-12 vs. 1 month, IQR: 0-4, p=0.277) or final BCVA (0.73±0.35 vs. 0.66±0.54 logMAR, p=0.291, Cohen's d=0.14). Eyes with preoperative nystagmus or strabismus had significantly worse final BCVA than the other eyes (0.81±0.45 logMAR vs. 0.58±0.50 logMAR, p=0.020, Cohen's d=0.48).

Cataract morphology was lamellar-cortical in 21 (26.3%), total/mature in 20 (25%), posterior polar in 18 (22.5%), posterior subcapsular in 9 (11.3%), anterior polar in 5 (6.3%), nuclear in 4 (5%), and oil drop in 3 (3.8%) eyes. Although the median time from diagnosis to surgery was significantly shorter for total/mature cataracts than other cataract morphologies (0 [IQR: 0-1.5] months vs. 3 [IQR: 0-9] months, p=0.001), only total/mature cataract showed a moderate positive correlation with final BCVA (r=0.480, p<0.001). The mean final BCVA of eyes with total/mature cataract was 1.11±0.58 logMAR, which was significantly worse than with the other morphologies (0.53±0.37 logMAR, p<0.001, Cohen's d=1.17). Ninety percent (n=18) of the total/mature cataracts were bilateral, and there was no significant difference in the final BCVA of eyes with

total/mature cataract in Group I (1.15±0.53 logMAR, n=12) and Group II (1.05±0.69 logMAR, n=8) (p=0.295).

Considering the entire study population (Group I and II), pseudophakic eyes had a significantly better final BCVA than the aphakic eyes (0.49±0.40 vs. 0.65±0.59 logMAR, p=0.043, Cohen's d=0.55). However, there was no significant difference between pseudophakic and aphakic eyes in developmental cataract (Group II) (p=0.541).

The mean final BCVA of the eyes with anterior vitrectomy was 0.75±0.54 logMAR, and there was no significant difference with the eyes that had an intact hyaloid membrane (0.63±0.47 logMAR, p=0.263, Cohen's d=0.22).

Aphakic treatment was performed in 59 eyes, which had a mean final BCVA of 0.74±0.5 logMAR. There was no significant difference between aphakic congenital and developmental cataract patients in final BCVA (0.79±0.46 and 0.65±0.59 logMAR, respectively, p=0.153).

The univariate analysis showed that having congenital cataract (β: 0.226 [95% CI: 0.01, 0.44], p=0.044), presence of preoperative nystagmus or strabismus (β: 0.229 [95% CI: 0.01, 0.45], p=0.041), total/mature cataract morphology (β: 0.509 [95% CI: 0.28, 0.62], p<0.001), and development of any complication (β: 0.204 [95% CI: -0.02, 0.41], p=0.070) was significantly associated with final BCVA (Table 2). However, the multivariate analysis revealed that only total/mature cataract morphology (β: 0.59 [95% CI: 0.37, 0.81], p<0.001) and development of any complication (β: 0.243 [95% CI: 0.04, 0.45], p=0.018) was significantly associated with final BCVA (Table 2).

Complications

The complication rates of the groups are given in Table 3. There were significantly more complications in Group I (n=18; 47.4%) than in Group II (n=10, 23.8%) (p=0.028, phi-coefficient: -0.25). However, there was no significant difference in the three-group comparisons (Group I vs. Group IIA vs. Group IIB, p=0.118). A second surgery was required in 18 eyes (22.5%) with indications of VAO in 8 (44.4%), fibrinous membrane in 5 (27.7%), secondary glaucoma in 3 (16.7%), and posterior synechia in 2 (11.1%) eyes. The rest of the complications (n=10, 12.5%) were treated medically.

Considering the predictive factors separately, a slight negative correlation was found between the development of complications and age at surgery (r=-0.265, p=0.018). Complications occurred in 6 eyes (28.6%) with IOL implantation. Furthermore, complications were seen in 22 eyes (37.2%), and no statistical difference was observed between IOL implantation and aphakia in complication development (p=0.472, phi-coefficient: 0.47). Complications were seen in 17 eyes (54.8%) in which anterior hyaloid membrane unintentionally ruptured during surgery, and 9 (29%) of them required a second surgery. Intraoperative anterior hyaloid membrane rupture was significantly correlated with complication development (r=0.331, p=0.003), but not with a second surgery (r=0.124, p=0.271). However, there was no correlation with bilaterality (r=-0.121, p=0.285), primary IOL implantation (r=-0.08, p=0.478), or presence of preoperative nystagmus and strabismus (r=0.130, p=0.249).

Univariate analysis showed that having a congenital cataract (β: -0.247, 95% CI: -0.49, -0.03; p=0.027) and intraoperative anterior hyaloid rupture (β: 0.331, 95% CI: 0.12, 0.56; p=0.003) were significantly associated with the development of complications. Binary logistic regression analysis (Omnibus test: 0.0001, Nagelkerke R^2: 0.211) also showed that having a congenital cataract (OR: 2.95, 95% CI: 1.07, 8.15; p=0.036) and intraoperative anterior hyaloid rupture (OR: 4.28, 95%CI:

Table 2. Univariate analyses and linear regression analysis for predicting factors of postoperative visual outcomes

Variables[a]	Univariate analyses	Multivariate analysis				
	p	B	95% CI	β	t	p
Constant[b]		0.365	0.21, 0.52		4.81	<0.001*
Total cataract morphology	<0.001*	0.588	0.37, 0.81	0.52	5.40	<0.001*
Presence of any complication	0.070*	0.243	0.04, 0.45	0.24	2.40	0.018*
Nystagmus or strabismus	0.042*	0.130	-0.06, 0.32	1.30	1.33	0.187
Congenital cataract	0.045*	0.058	-0.14, 0.26	0.06	0.58	0.563

[a]Factors were ordered according to the significance level of linear regression analysis, [b]R^2_{Adj} = 0.318 (n=80, p<0.001); F [6, 75] = 10.214, p<0.001. *Statistical significance. CI: Confidence intervals for B, IOL: Intraocular lens

Table 3. Distribution of complications in the study groups and according to intraoperative anterior hyaloid status

Complications	Group I (n=38 eyes)	Group IIA (n=21 eyes)	Group IIB (n=21 eyes)	Intact anterior hyaloid (n=49 eyes)	Ruptured anterior hyaloid (n=31 eyes)	Total (n=80 eyes)
Posterior synechia, eyes (%)	6 (15.8)	1 (5.9%)	2 (9.5)	4 (8.9)	5 (16.1)	9 (11.3)
Capsular opacification, eyes (%)	4 (10.5)	0 (0.0)	4 (19.0)	4 (8.9)	4 (12.9)	8 (10)
Pupillary membrane, eyes (%)	4 (10.5)	1 (4.8)	0 (0.0)	1 (2.2)	4 (12.9)	5 (6.3)
Intraocular pressure spike, eyes (%)	1 (2.6)	2 (9.5)	0 (0.0)	1 (2.2)	2 (6.5)	3 (3.8)
Secondary glaucoma, eyes (%)	3 (7.9)	0 (0.0)	0 (0.0)	1 (2.2)	2 (6.5)	3 (3.8)

1.55, 11.77; p=0.005) increased the risk of development of complications.

Discussion

In this study, total/mature cataract morphology and development of postoperative complications were significantly associated with final BCVA after pediatric cataract surgery. In addition, having a congenital cataract and unintentional intraoperative anterior hyaloid rupture leading to anterior vitrectomy increased the risk of postoperative complication development.

Total/mature cataracts are among the most common pediatric cataracts, with a worse visual prognosis, and early surgical intervention is recommended to prevent deprivation amblyopia.[16,17,18,19] The overall final BCVA of the total/mature cataract eyes in our study (1.11±0.58 logMAR) was comparable with the mean BCVA in a study conducted by Zhang et al.[20] (1.07±0.53 logMAR, n=156 eyes), and slightly worse than in a study conducted by Lin et al.[21] (0.89±0.30 logMAR, n=88 eyes). Although we noted that total/mature cataracts had a significantly shorter time from diagnosis to surgery, regression analysis revealed that they were significantly associated with worse final BCVA. Among the eyes with a final BCVA worse than 1.0 logMAR, 54.8% (17/31) had total/mature cataract morphology, which was 85% (17/20) of the eyes with total/mature cataracts. That might have been a result of more severe obscuration of visual stimulus by total/mature cataracts than by other cataract morphologies, leading to profound deprivation amblyopia, which is generally more severe than strabismic or anisometropic amblyopia.[22]

In our study, the development of any complication was also associated with final BCVA, which supports the published literature.[1,8] In our study, the overall complication rate was 35% (28/80 eyes), with a 22.5% (n=18) second surgery rate. These rates are comparable with the Pediatric Eye Disease Investigator Group study, which had a complication rate of 33.6% excluding amblyopia and a second surgery rate of 17% in 1132 eyes.[23] We found that having a congenital cataract diagnosed and treated before 12 months of age was a significant risk factor for complications. Studies in the literature also report that younger age is associated with an increased complication risk.[4,5] Studies have recently focused on the relationship between surgery at a younger age with or without primary IOL implantation and the development of secondary glaucoma.[24,25,26] Solmaz et al.[27] reported a significantly lower mean age at surgery in patients who developed glaucoma, but they did not observe a difference in glaucoma incidence between aphakic and pseudophakic cases. We observed secondary glaucoma in only 3 eyes (3.75%), all of which were in the aphakic congenital cataract group. Reported rates of secondary glaucoma vary between 2% and 58% in the literature.[28] Our relatively low rate was comparable with that reported in a multicenter study by Nagamoto et al.[29] (3.54%; 25/706 eyes), which also demonstrated a significantly higher rate in aphakic patients (p=0.003).

VAO occurred in a total of 8 eyes (10%) in our study, with comparable rates between the eyes that had only posterior CCC (n=4, 8.2%) and posterior CCC with anterior vitrectomy (n=4, 12.9%) (p=0.491). The incidence of VAO was reported to be 100% in eyes without posterior CCC and was reduced by performing posterior CCC and anterior vitrectomy.[18,30,31] Demirkılınç Biler et al.[32] reported that while VAO was seen in 34.3% of eyes (23/67) that underwent posterior capsulotomy and anterior vitrectomy, the prevalence was 76.4% (n=26/34) in eyes without posterior capsulotomy. Similarly, Batur et al.[33] found a 70% rate of posterior capsular opacification and 50% VAO in eyes without posterior CCC. A recent meta-analysis including 11 randomized controlled trials concluded that anterior vitrectomy minimizes the risk of VAO in pediatric cataracts.[9] However, in our study, the positive effect of adding anterior vitrectomy to posterior CCC on VAO could not be demonstrated as other previous studies.[10,11,12]

Hosal and Biglan[13] found that only age at surgery was significantly associated with membrane formation after pediatric cataract surgery, with a 4.74-fold increase in patients younger than one year of age. We also observed a higher rate of membrane formation in patients before the age of 12 months (Group I, congenital cataracts) (10.5% vs. 2.3%, compared to Group II, p=0.105). There was also a higher rate of membrane formation in eyes with intraoperative anterior hyaloid rupture leading to anterior vitrectomy compared to eyes with intact anterior hyaloid membrane (12.9% vs. 2.2%, p=0.051) in our study. In contrast, Hosal and Biglan[13] suggested that primary posterior CCC combined with a planned anterior vitrectomy was protective against secondary membrane formation. In a recent study that controlled for individual variations in inflammatory factors among patients by performing posterior CCC without anterior vitrectomy and posterior IOL capture in one eye and posterior CCC with anterior vitrectomy and in-the-bag IOL implantation in the fellow eye of the same patient, Kaur et al.[14] observed significantly more inflammatory complications in the anterior vitrectomy group (p=0.004). They hypothesized that anterior vitrectomy might contribute to fibrinous complications.[14] We think that uncontrolled rupture of the anterior hyaloid membrane might result in more interaction between the anterior vitreous and aqueous humor, causing more inflammatory and fibrinous reactions in the anterior chamber.

Study Limitations

The main limitations of our study are its retrospective nature and limited sample size. However, the effect sizes of statistical comparisons were given to determine the difference between factors regardless of the number of cases. Although the results are not sufficient to be generalized, they shed light on the factors associated with final visual acuity and the development of complications in pediatric cataract patients.

Conclusion

This retrospective, observational, single-center study revealed that total/mature cataract morphology and the presence

of any postoperative complications adversely affected the final visual acuity of pediatric cataract patients. Moreover, having a congenital cataract or intraoperative anterior hyaloid membrane rupture independently increased the risk of complications in these patients.

Ethics

Ethics Committee Approval: The Institutional Review Board of Marmara University Faculty of Medicine approved the study protocol (decision no: 09.2020.1169, date: 06.11.2020), and the study was conducted following the principles of the Declaration of Helsinki.

Informed Consent: Obtained.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: E.Ç., Concept: V.D., M.O.S., E.B.V., E.Ç., Design: V.D., M.O.S., E.B.V., E.Ç., Data Collection or Processing: V.D., E.B.V., Analysis or Interpretation: V.D, M.O.S., E.Ç., Literature Search: V.D., E.B.V., Writing: V.D.

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