

Effectiveness and safety of cataract surgery in eyes treated for retinoblastoma in the past. - A cohort study

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Abstract

Objectives

To review the effectiveness, safety, and determinants of cataract surgeries in eyes treated for retinoblastoma (RB) in the past at a tertiary eye hospital in central Saudi Arabia.

Methods

This was a retrospective cohort study. We included RB cases from 1983 to 2025 in Saudi Arabia that underwent cataract surgery and were monitored for visual gain, globe integrity, and complications. We assessed associations between demographics, RB treatment details, lens, surgical steps, complications, and visual gain.

Results

The cohort comprised 74 eyes of 70 patients. Grade D Rb was in 43 (58.1%) eyes. Rb treatment included cryotherapy (44.6%), systemic chemotherapy (81.5%), and transpupillary thermotherapy (23%). Posterior subcapsular lens opacity was in 60% of eyes. The median intervals from Rb treatment to cataract detection and cataract detection to cataract surgery were 38.5 and 25 months, respectively. Cataract was diagnosed in 50% of eyes 50 months after Rb treatment. Different Rb treatment modalities varied in the time interval between Rb treatment and cataract diagnosis. An intraocular lens was implanted in 66 eyes (89.2%). The E1 rate at a median follow-up of 111 months was 35% (95% CI 23.6–47.4). Severe visual impairment was reduced from 54.1% to 37.9%. The complication rate was 50%. [Posterior capsular opacification (21.6%) and corneal scar (18.9%). E1 was associated with Phacoemulsification + IOL ($P = 0.02$), complications ($P = 0.003$), recurrence of tumor ($P = 0.04$), and younger age ($P = 0.04$).

Conclusions

RB treatment-induced cataract, if operated on, improved vision in more than one-third of eyes, and these children could have the potential for low-vision rehabilitation nine years after cataract surgery. These children need lifelong monitoring for complications and RB recurrence.

INTRODUCTION

Retinoblastoma (RB) is the leading childhood ocular malignancy with a global incidence of 0.82%. Early detection and reduced malignancy-related mortalities in children with RB have caused increased prevalence and burden, especially in low-income countries.¹ The incidence of cataract among eyes with RB is low (18.2%) compared with the incidence of cataract in children, reported to be 1.8 to 3.6 per 10,000 children per year, and warrants monitoring and prompt management of cataract among RB-

treated children to improve the vision-related quality of life of these vulnerable children.^{2, 3} RB treatment modalities depend on grades of RB, and they include focal therapies such as transpupillary thermotherapy, cryotherapy in combination with chemotherapy by intravenous, intravitreal, or intraarterial routes.^{4, 5} In high-income countries, death due to RB is rare, and therefore the risk of chemotherapy-induced cataract in these surviving children following RB treatment is high.^{6,7} Both disease- and treatment-induced lens changes, mainly posterior subcapsular cataract, need intervention after management of RB. Cataract surgery is an intraocular procedure performed to improve vision in the RB-treated eye, with promising results.^{8, 9} Literature on visual outcomes and globe integrity is mainly based on small case series.^{10,11–14}

Our institute has maintained a retinoblastoma registry since 2012, which initially included all cases since 1983; the electronic registry was later included in the Saudi Cancer Registry and has nearly 1000 registered children diagnosed and managed by expert pediatric ophthalmologists and oncologists through 2025.^{15, 16} With such a large and robust dataset, it would be interesting to review the outcomes and determinants of cataract management in eyes previously treated for RB.

We present the effectiveness and safety of cataract surgeries performed in eyes treated for retinoblastoma between 1983 and 2025 at a tertiary eye hospital in central Saudi Arabia.

METHODS

The institution's research and ethics committee of King Khaled Eye Specialist Hospital and Research Center, Riyadh, Saudi Arabia, approved this study. (IRB # 1884-R) Patient consent was waived because the study was a retrospective review of health records. However, we strictly followed the Declaration of Helsinki for conducting health research. We delinked each patient's health records from personal identifiers during data analysis.

This was a retrospective review of health data. Our study population included information from the retinoblastoma registry, operation logbook, and Health Information Management System for patients diagnosed with retinoblastoma and lens opacity and treated at our institute between 1983 and 2025. We included patients with at least six months of follow-up after cataract surgery.

Demographic information included age (in months) at presentation, diagnosis of RB, cataract, cataract surgery, and last follow-up, gender, and nationality. This study used the International Classification of Retinoblastoma to grade retinoblastoma in each eye.¹⁷ RB details included the affected eye, macular involvement of the tumor mass, eyes subjected to chemotherapy, and RB treatment modalities such as transpupillary thermotherapy (TTT), cryotherapy, external beam radiation therapy (EBRT), and chemotherapy (systemic, intravitreal, and intra-arterial). Radiotherapy included the dose of radiation. The chemotherapy included the number of cycles and medications. We documented the interval between RB diagnosis and cataract diagnosis, the interval between cataract detection and cataract surgery, and the duration of postoperative follow-up (in months).

Lens status at presentation included cataract morphology and the primary indication for cataract surgery. We also documented whether the fellow eye was enucleated as part of Rb treatment. Cataract surgery details included use of phacoemulsification or lens aspiration, location of the corneal incision, type of lens implanted, power of IOL, and any concurrent procedure undertaken.

The child is admitted for investigations, and the radiotherapy or chemotherapy sessions are conducted in our hospital as well as King Faisal Specialists Hospital and Research Center. Depending upon the grade of RB, local or systemic therapy is planned. Parents are counseled about the procedure and possible outcomes. If RB is bilateral, the eye with worse prognosis is enucleated, and the fellow eye with RB of lower severity is salvaged. We collected chemotherapy and radiotherapy details from the oncology unit of King Faisal Specialists Hospital and Research Center, Riyadh, Saudi Arabia.

We documented visual acuity before cataract surgery and at follow-up at 6 to 8 weeks after cataract surgery. For children older than 2.5 years, we used the Lea symbol chart-based ETDRS chart at 6 meters or optotypes at 1 meter to document best-corrected distance visual acuity (BCVA). Those who could not identify the Lea optotype were tested for detection of hand movement and the counting fingers method in front of the child's face. For preverbal children, we used a hiding Hydrie of 100% contrast and a Lea paddle to document perception of light and projection of light rays. We converted all BCVA notations to LogMAR values using an internationally accepted table for converting distance visual acuity.¹⁸

At our institute, pediatric cataract surgery includes lens aspiration, posterior capsulorhexis, and anterior vitrectomy. Depending on the child's age and capsular support, we implant an IOL as part of cataract surgery or subsequently. In eyes with previous RB treatment, we rule out active tumor before planning surgery. We avoid posterior capsulotomy and anterior vitrectomy. We also take precautions to avoid inadvertently puncturing the posterior lens capsule to minimize the risk of RB seeding coming into the anterior segment of the eyeball.

We recorded intra- and postoperative complications detected during scheduled follow-up visits and their management details. They included capsular thickening, vitreous hemorrhage, recurrence of RB, corneal changes following surgery, iridocyclitis, retinal detachment, glaucoma, changes in iris, and phthisis. We also noted the need for enucleation after cataract surgery.

The steps for evaluating different parts of the eye in the study followed the standard preferred pattern of practice described in the literature.¹⁹

Effectiveness¹ was defined as improvement of vision at follow-up after cataract surgery compared to BCVA before cataract surgery. If vision improved or remained the same, we considered it a gain; decreased vision after cataract surgery was considered 'No gain'.

The effectiveness 2 was defined as improvement in visual impairment grades.²⁰

Eyes that were to be enucleated/eviscerated or became phthisic were considered to have failed to maintain eyeball integrity (Effectiveness 3).

Safety was defined as not having any intra- or postoperative complication that needed active intervention.

We piloted the data collection form, cross-checked data from various sources, ran consistency checks, and consulted the experienced operating surgeons to understand variations in operative details as noted in the logbook. To address missing data, we analyzed outcomes with all missing information as failed and with all missing information as E1 success to estimate the lowest and highest possible success rates.

We collected the data in a Microsoft Excel spreadsheet. After removing duplicates and adding eye and person information, we transferred the data into the Statistical Package for the Social Sciences. (SPSS 25), (IMB, NY, USA). We presented categorical variables as numbers and percentages. To compare outcomes between two categorical subgroups, we estimated relative risk, its 95% confidence interval, and two-sided P values. For more than two subgroups, we used Student's t-test and calculated chi-square value, degrees of freedom, and two-sided P values. We confirmed the non-normal distribution of numerical variables by reviewing their distributions and presented them as median and interquartile range. To compare subgroup outcomes, we used a nonparametric method to estimate the coefficient and two-sided P values. We included all independent variables with a statistically significant association/correlation with E1 in a binary regression model, using the step-out method to identify predictors of visual gain after cataract surgery in eyes previously treated for RB. A p-value of < 0.05 was considered statistically significant. To assess the effect of different RB treatment modalities on the development of lens opacities, we used SPSS survival analysis and plotted a Kaplan-Meier graph.

RESULTS

Our cohort comprised 74 eyes from 70 patients with cataract in eyes previously treated for retinoblastoma. **Table 1** presents their demographics and ocular profile at presentation.

Table 1: Demographic information of patients with cataract in eyes treated for retinoblastoma in the past.

Demographic variables		
Age at presentation (months)	Median	15.5
	IQR	9.0; 37.3
Age at diagnosis of cataract in treated eye (months)	Median	70
	IQR	48;96
Age at cataract surgery (months)	Median	96
	IQR	72;160
		Number (%)
Gender	Male	39 (55.7)
	Female	31 (44.3)
Nationality	Saudi	58 (82.9)
	Syrian	1 (1.4)
	Sudan	1 (1.4)
	Egypt	2 (2.9)
	Yemen	5 (7.1)
	Indonesia	1 (1.4)
	Eretria	1 (1.4)
Retinoblastoma-related information		Number (Percentage)
Laterality	Bilateral	4 (5.4)
	Unilateral	70 (94.6)
Eye involved	Right	35 (47.3)
	Left	39 (52.7)

International classification of Retinoblastoma severity grade	Normal	1 (1.4)
	Grade A	6 (8.1)
	Grade B	11 (14.9)
	Grade C	7 (9.5)
	Grade D	43 (58.1)
	Grade E	2 (2.7)
	Missing information	4 (5.4)
Tumor involved macula	Yes	38 (51.4)
	No	36 (48.6)

The proportion of males and females in the cohort was not different. Most children were diagnosed with RB between 1 and 2 years of age. Most of the RB patients were Saudi nationals. Nearly 58% of eyes had Grade D RB. In half of the cohort, RB involved the macula.

Retinoblastoma treatment modalities were either combined or stand-alone. they included cryotherapy; 33 (44.6%), chemotherapy; 62 (83.8%), trans pupillary thermotherapy; 17 (23%), external beam radiotherapy; 23 (31%), intra arterial chemotherapy 1(1.4% and intravitreal melphalan 1 (1.4%). Information on Rb treatment was missing in 4 eyes.

The median interval from RB treatment to cataract detection was 38.5 months (IQR 28.3–62.0), and from cataract detection to cataract surgery was 25 months (IQR 9–49).

Table 2 provides details of the lens and cataract surgeries.

Table 2: Lens opacity and cataract surgery details in eyes following treatment for retinoblastoma

Type of cataract	Number (Percentage)
Congenital	3 (4.1%)
Nuclear	1 (1.4%)
Posterior Subcapsular	45 (60.6%)
White	2 (2.7)
Dense	10 (13.5)
Posterior polar	1 (1.4)
Anterior subcapsular	1 (1.4)
Posterior subcapsular and cortical	5 (6.8)
Posterior and anterior subcapsular	1 (1.4)
Not specified	3 (4.1)
Information missing	2 (2.7)
Cataract surgery technique	
Phaco with IOL	35 (47.3)
Lens aspiration with IOL	31 (41.9)
Posterior Capsulotomy	2 (2.7)
Lens aspiration without IOL	6 (8.1)
With anterior vitrectomy	1 (47.3)
Location of corneal incision for cataract surgery	
Superior	43 (58.1)
Temporal	15 (20.3)
Missing	16 (21.6)
Intraocular lens implant and type	
IQ	28 (37.8)
Multipiece Tecnis	3 (4.1)
Alcon multipiece	1 (1.4)
Alcon EDOF Vivify	1 (1.4)
Information on type of IOL missing	33 (44.6%)
No IOL	18 (24.3)

Additional procedure performed	
Primary posterior capsulotomy	8 (10.8)
Aqueous lens sample	2 (2.7)
YAG capsulotomy	4 (5.4)

Six in ten eyes had subcapsular lens opacities. Nearly half underwent phacoemulsification with intraocular lens implantation. None of the ten eyes had an IOL implanted.

We reviewed clear-lens survival after RB treatment using Kaplan-Meier analysis. **Figure 1.**

More than 50% of eyes developed cataract and related vision impairment in the first 50 months. We reviewed the development of lens opacity following three RB treatment modalities. **Figure 2 and 3:**

Thermotherapy seems to have a slower and less cataractous effect than other RB treatment modalities. The median follow-up duration after cataract surgery (N = 57) was 111 months (IQR 40-156).

Vision-related information before and after cataract surgery (Table 3) was available for 62 eyes.

Table 3: The best-corrected visual acuity before and after cataract surgeries in eyes with lens opacities following retinoblastoma treatment.

	Number of eyes	Median of BCVA (LogMAR)	Interquartile range	Validity
Before cataract surgery	65	1.0	0.65 – 1.6	Wilcoxon signed test Z = -4.7, P <0.001
After cataract surgery	70	0.85	0.3-1.6	

The vision improvement/stability (E1) was achieved in 22 eyes. The rate was 35% (95% CI 23.6-47.4). If information on 12 eyes with missing data on vision is considered not to have vision gain, the E1 could be as low as 29.7% (95% CI 19.3-40.1), and if all 12 eyes with missing information are assumed to gain vision, the E1 could be as high as 45.9% (95% CI 34.6 -57.3).

Table 4 compares visual impairment grades before and after cataract surgery in the cohort.

Table 4: Visual impairment grades before and after cataract surgery in eyes treated for retinoblastoma in the past.

Visual impairment grades	Before	After	Validation
	Cataract surgery	Cataract surgery	
	Number (%)	Number (%)	
20/20 to 20/60	3 (4.1)	23 (31.1)	Chi square = 13, df = 3, P = 0.0003
<20/60 to 20/200	22 (29.7)	19 (25.7)	
<20/200 to 20/400	9 (12.2)	11 (14.9)	
<20/400	31 (41.9)	17 (23.0)	
Missing	9 (12.2)	4 (5.4)	

The change in VI grade (E2) was significant. (Wilcoxon signed test $Z = -4.7$, $P < 0.001$)

Preservation of eyeball (E3) after cataract surgery was achieved in 67 [90.5% (95% CI 83.9 – 97.2)]. Seven eyes had to be enucleated after cataract surgery during follow-up of a median of 9.25 years.

The complication rate (Safety) during and after cataract surgery was 37/74 (50%; 95% CI 38.6–61.4). The intraoperative complication included Posterior capsular opacification in one eye (14%); later complications are given in **Table 5**.

Table 5: Complications after cataract extraction in eyes treated for retinoblastoma in the past.

Late complications	Number (Percentage)
Posterior capsular opacification	16 (21.6)
Radiation retinopathy	3 (4.1)
Corneal scar	14 (18.9)
Band-shaped keratopathy	4 (5.4)
Tractional retinal detachment	3 (4.1)
Pupillary membrane	3 (4.1)
Recurrent Corneal Erosion	1 (1.4)
Macular atrophy	1 (1.4)

Visual gains were associated/correlated with the independent variables. (**Table 6**)

Table 6 Determinants of visual gain after cataract surgery in eyes treated for retinoblastoma in the past.

Independent variables		Visual gain achieved (N =22)		Vision gain not achieved (N = 40)		Validation
		Number	Percentage	Number	Percentage	
Grade of Rb	Normal	0	0.0	1	2.5	RR =0.99, 95% CI 0.5-1.9, P = 0.97
	A	1	4.5	5	12.5	
	B	3	13.6	8	20	
	C	3	13.6	3	7.5	
	D	12	54.5	22	55	
	E	1	4.5	0	0	
	Missing	2	9.1	1	2.5	
Type of Rb treatment	TTT	3	13.6	10	25.0	Chi square = 0.03, df = 3, P = 0.87
	Cryotherapy	13	59.1	17	42.5	
	Chemotherapy	17	77.3	32	80.0	
	EBRT	4	18.2	7	17.5	
Macula involvement	Yes	13	59.1	14	35.0	RR = 1.9, 95% CI 0.9 – 3.7, P = 0.07
	No	9	40.9	26	65.0	
Gender	Male	14	63.6	20	50	RR = 1.44, 95% CI = 0.7 – 2.9, P = 0.3
	Female	8	36.4	20	50	
Type of cataract surgery	Phaco + IOL	18	81.8	17	42.5	RR = 1.7, 95% CI 1.1 – 2.6, P = 0.02
	Lens aspiration +IOL	6	27.3	21	52.5	
	Lens aspiration (no IOL)	1	4.5	2	5	
Fellow eye enucleated	Yes	17		26		RR = 1.16, 95% CI 0.8 – 1.6, P = 0.4
	No	5		13		
Complications	Yes	16	72.7	13	32.5	RR = 3.0, 95% CI 1.4- 6.7, P = 0.003
	No	6	27.3	27	67.5	
Tumor recurrence	Yes	3	13.6	0	0	RR = 3.1, 95% CI 2.1

	No	19	86.4	40	100	- 4.5, P = 0.04
Interval between diagnosis of Rb and cataract (months)	Number	18		34		M-W Z = -1.2,
	Median	35		43		P = 0.23
	IQR	23-65		31.3-70.5		
Interval between cataract diagnosis and surgery (Months)	Number	19		34		M-W Z = -1.04
	Median	31		17.5		P = 0.3
	IQR	17-49		7.8-93.3		
Age at presentation (Months)	Number	20		40		M-W Z = -2.1,
	Median	12		24		P= 0.04
	IQR	6.8- 24.3		12-51.5		
Duration of follow-up after cataract surgery	Number	19		29		M-W Z = -0.53,
	Median	116		107		P = 0.6
	IQR	41-170		28.5-143		

E1 was associated with RB not involving the macula [RR = 1.9, P = 0.07], Phaco +IOL (P = 0.02), complications (P = 0.003), recurrence of tumor (P = 0.04), and younger age (P= 0.04). Binary regression analysis suggested that after addressing interactions among preoperative factors, only the presence of intra- and postoperative complications was a significant predictor of visual gain. [Adjusted Odds Ratio = 4.8 (95% CI 1.5 – 15.8), P = 0.01]

DISCUSSION

Development of cataract was noted 50 months after Rb treatment. Visual gain was achieved in three of ten operated eyes. However, residual vision was sufficient for low-vision rehabilitation in three-fourths of operated eyes. Eyeball counter was maintained after cataract surgery in nine of ten eyes. Complication rate in such vulnerable eyes after cataract surgery was as high as 50%. Posterior capsular opacity was the main postoperative complication. Vision improvement after cataract surgery was affected by age, type of cataract surgery, postoperative complications, and RB recurrence.

This study is in a country with a very high incidence of RB,²¹ and the findings will be useful not only to Saudi Arabia but also to other high-income countries with high incidence and adequate resources to manage RB and related cataract. It provides insight into the potential to offer low vision rehabilitation to these vulnerable children many years after RB treatment. This is perhaps the largest cohort of children with cataract in eyes that have previously received RB treatment. With 75 eyes in our cohort, the visual gain rate was 37%. We used the OpenEpi statistical calculator to estimate the power of the cohort

study.²² Assuming a success rate of 70% for pediatric cataract without RB, as reported by Aldamri et al.²³ the present cohort will have 100% power. Therefore, the outcomes of the present study are likely to be true results and worth noting when providing eye care to children with RB.

In our study, 35% of operated eyes showed visual improvement and stability. If we include those with missing information as improved, this could be as high as 45%. Kaliki et al. noted that 55% of eyes gained vision in their series of 29 eyes with RB-related cataract.¹⁰ Ratings et al. studied 51 eyes with RB-related cataract that showed visual improvement in 61.3% of eyes.¹³ Bayraktar et al. reported that all six eyes of children with RB-related cataract who underwent phacoemulsification and Intraocular lens implantation improved vision.²⁴ Given rapidly changing RB treatment modalities and efforts to reduce radiation-related side effects such as lens opacities and cataract surgeries in children,²⁵ the findings of the present study should be compared with studies from the previous decade with caution. The caregivers should offer vision outcome-related counseling with caution.

Children with RB differ from children with other types of pediatric cataract, as RB treatment has already compromised ocular tissues, resulting in impaired visual functions and compromised vision-related quality of life.²⁶ In the same institute, the visual outcomes improved in more than 70% of eyes with pediatric cataract.²²

We noted that SVI, present in 57% of eyes with RB before cataract surgery, decreased to 37% after cataract surgery. In their review of 18 eyes operated for cataract after treating retinoblastoma, Osman et al. reported that 27.8% had SVI.²⁷ Hoehn et al. reported that SVI was in nearly three-fourths of operated eyes.²⁸ This index of intervention outcomes is useful for counseling parents about cataract surgery, as it highlights the potential for low-vision rehabilitation and using residual vision for daily living activities in children who had prolonged and traumatic experience during RB treatment.

We experienced early and late complications in half of the operated eyes. The leading complication was posterior capsular opacification. Kaliki et al had a 52% rate of PCO.¹⁰ In a small series in Turkey, all eyes had PCO postoperatively.²⁴ Hoehn et al managed PCO with laser capsulotomy in 63% of RB-related eyes after cataract surgery, with improved visual outcomes.²⁸ Further investigation is warranted to understand the reasons for the high complication rate. A more conservative approach during cataract surgery, and avoiding posterior capsulotomies that are routinely performed in pediatric cataract surgery, could explain the high rates of PCO in eyes with RB. Caregivers need to monitor and manage PCO to address impaired vision postoperatively. Because the present study site is a training institute, it would be interesting to study differential complication rates among trainees vs experienced pediatric ophthalmologists.

In as many as 43 children, the fellow eye was enucleated. This shows the challenge of performing eye surgery in the only eye of these children. Postoperatively, three of them developed RB tumor recurrence during a median of nine years of follow-up. All three eyes had improved vision after cataract surgery. The

care provider thus can use this information while counseling for promoting cataract surgeries if needed in such critically risky circumstances with hope of improving VRQL of these children. However, Honaver et al. reported a 31% recurrence rate, 36% enucleation rate, and 7% metastasis rate of RB in a cohort of RB children who had ocular surgery. Despite these high rates of unfavorable outcomes, the authors considered cataract surgery a safe and effective intervention for RB cases with cataract.³⁰

Cataract development in the eye treated for RB could be due to iatrogenic effects of radiotherapy or chemotherapy. It could also be due to pediatric cataract detected incidentally during frequent eye checkups. The median interval between completion of RB therapy and cataract detection in our study was 40 months. Kim et al reported this interval of 79 months.¹¹ Ratings et al. noted a median interval of 54 months between RB treatment and cataract surgery.¹³ We compared this interval across different treatment modalities and found no significant difference. Miller et al. reported a 42-month interval between EBRT for RB and cataract in 16 eyes.³¹ Hanover et al. found that eyes with unfavorable outcomes after cataract surgery had a shorter interval (median 6 months) than eyes with favorable outcomes (median interval of 26 months).³⁰ The impact of a longer interval on outcomes warrants investigation. Alterations in lens physiology seem to be a slow process after RB treatment, causing lens opacities after such intervals. Both parents and caregivers should be aware of this gap between RB treatment completion and cataract development.

Older age was negatively associated with visual gain in our study. Amblyopia may increase with age in eyes with media opacity, which may explain this association. [29] Progression of Rb stage with increasing age could also explain less promising vision in older children after cataract surgery.

Eyes operated on with phacoemulsification with lens implant had a significantly higher rate of visual gain than those operated on with lens aspiration and IOL implant. This matched with findings from a study about pediatric cataract in South India.³² Phacoemulsification is used for children older than 2 years, while children younger than 2 years have soft lens material that can be easily aspirated. But it can cause PCO more often. Therefore, one should use caution when interpreting the differential outcomes in the two cataract surgeries noted in the present study.

In our study, postoperative complications were associated with poor visual gain after cataract surgery. PCO, the main complication, is treated with laser capsulotomy and therefore may not cause permanent visual impairment. We noted tumor reactivation in three eyes. This has also been noted in the literature after cataract surgery in eyes successfully treated for RB.^{12, 27}

Our study had a few limitations. Although the cohort comprised a large sample, loss of data in health data spanning 42 years, with different forms of records that included paper forms of data, institutions and national registries, and electronic health records, had affected the research. We conducted tipping analysis to address this bias. Because oncology services and eye care were managed at two different institutes, some RB chemotherapy-related information was incomplete. Therefore, interpret the association between type of therapy and cataract surgery outcomes with caution.

CONCLUSIONS

Small subsamples of modern RB treatment modalities, such as intra-arterial and intravitreal chemotherapies and combinations of therapies, limited our ability to provide evidence on the impact of individual therapies on outcomes for both cataract formation and visual outcomes after cataract surgery. We see fertile ground for further research and for sharing high-level evidence to recommend RB therapies with better long-term outcomes, as well as to promote management while counseling parents of children with RB. As Friedman et al had recommended, we also suggest addressing oculo-visual problems to improve outcomes of cataract surgery and thereby improve health-related quality of life of retinoblastoma survivors.³³

RB treatment-induced cataract, if operated on, improved vision in more than one third of eyes, and these children could have the potential for low vision rehabilitation nine years after cataract surgery. These children need lifelong monitoring for complications and RB recurrence.

Declarations

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Author Contribution

Ramah Nazer: Planning, Data collection, Data analysis, Manuscript writing
Hanan Makhdoum: Planning, Data collection, review of manuscript
Mohammed AlMatrafi: Planning, Data collection, input in manuscript writing
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Data Availability

The data is the property of King Khaled Eye Specialist Hospital and can be made available by the corresponding author on request.

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Figures

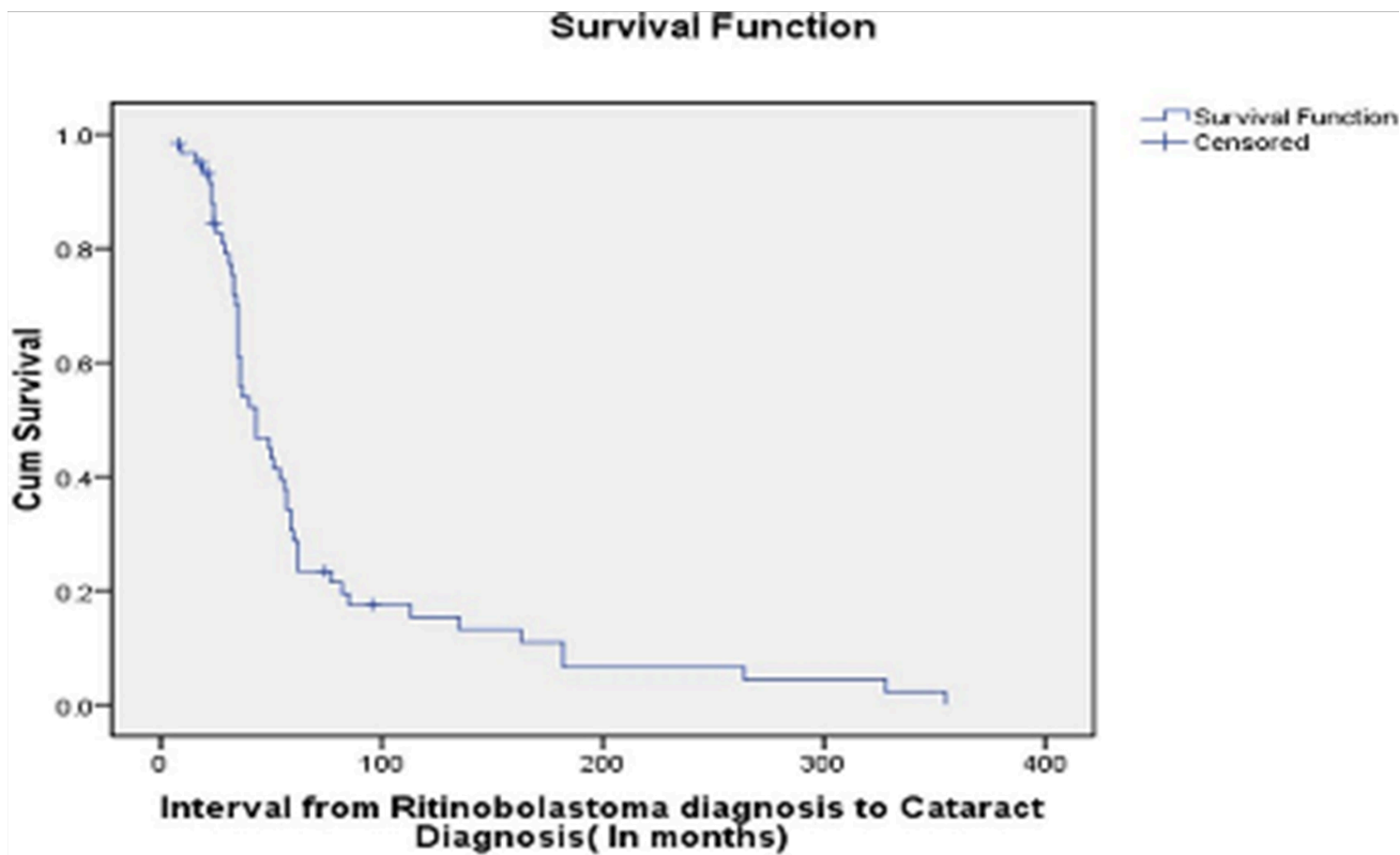


Figure 1

Kaplan-Meier survival curve showing the cumulative probabilities of clear lens in eyes after treatment for retinoblastoma.

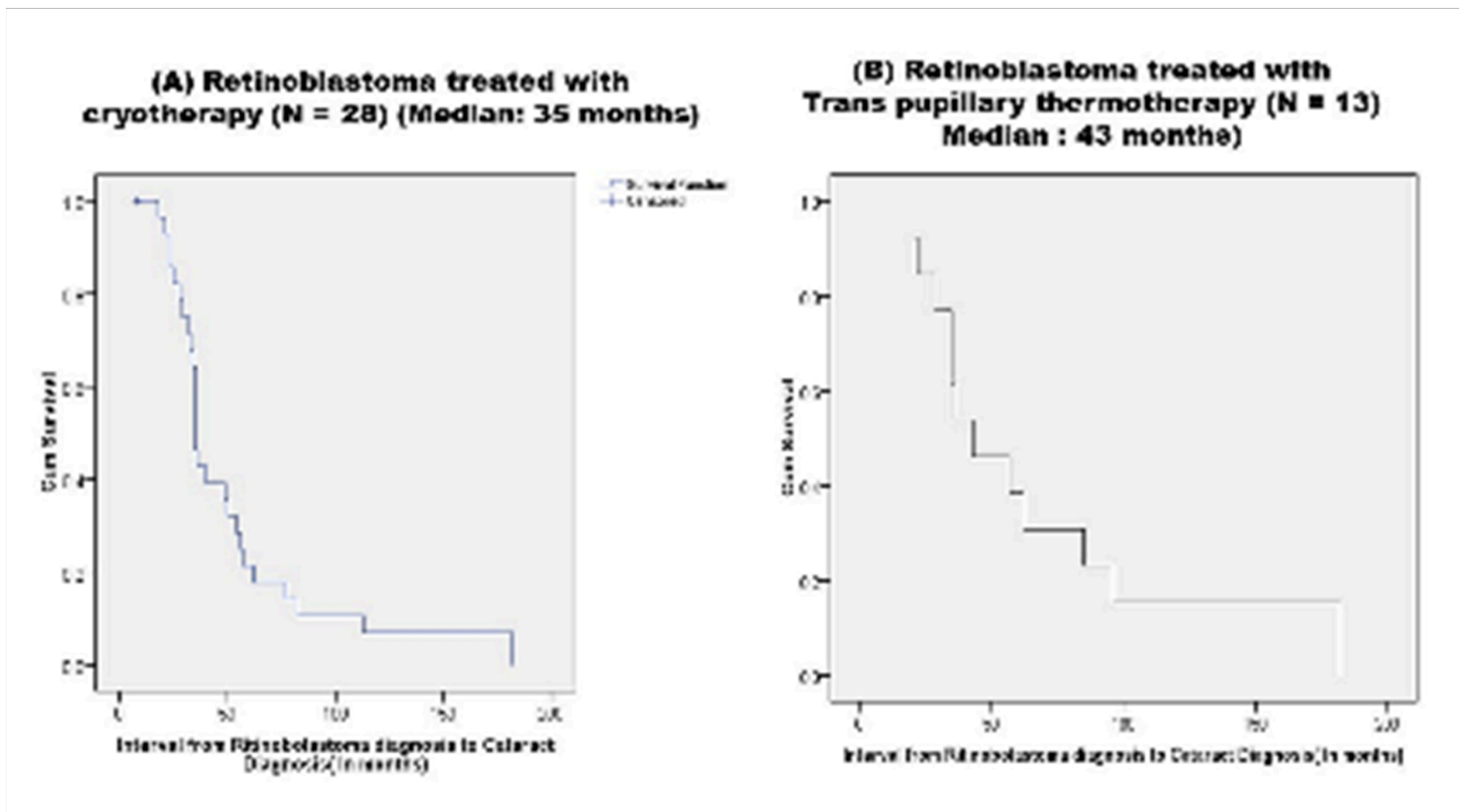


Figure 2

Kaplan-Meier survival curve showing the cumulative probabilities of clear lens in eyes after different treatment modalities for retinoblastoma.

A. Cryotherapy

B. Transpupillary thermotherapy

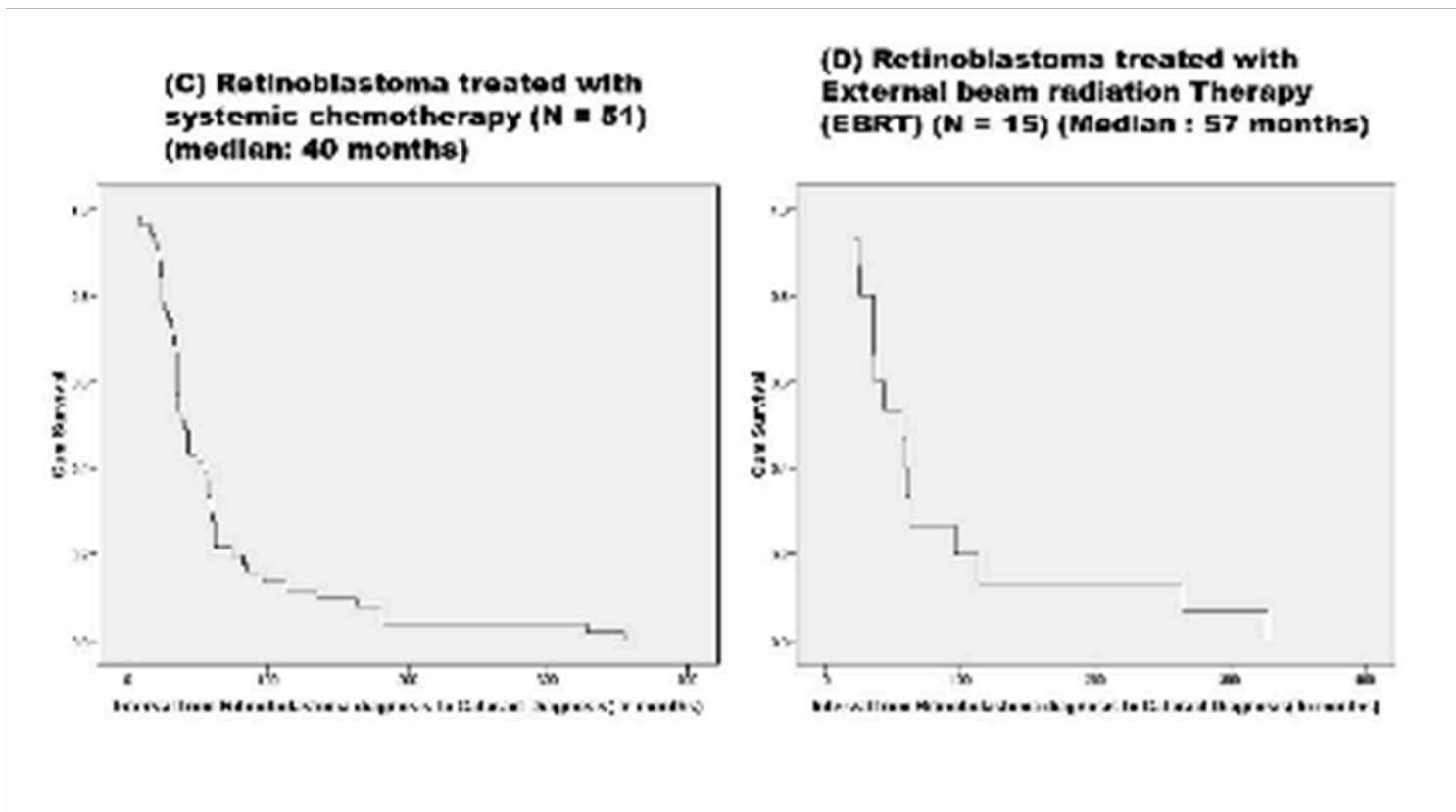


Figure 3

Kaplan-Meier survival curve showing the cumulative probabilities of clear lens in eyes after different treatment modalities for retinoblastoma.

C Systemic chemotherapy

D External Beam Radiation therapy