Pediatric cataract surgery following treatment for retinoblastoma: a case series and systematic review

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BACKGROUND

- Globe salvage therapies for retinoblastoma (RB) may induce secondary cataract.
- Cataract may preclude tumor evaluation and limit visual development.
- Previous reports of cataract surgery in eyes treated for RB focus on outcomes of radiation-induced cataract.
- Unique intraoperative findings not previously reported and surgical guidelines not established.

PURPOSE

To determine the visual and refractive outcomes, and ocular and systemic complications of cataract surgery in eyes treated for retinoblastoma.

METHODS

STUDY DESIGN

- Retrospective, single-institutional, consecutive case series
- Systematic review indexed by Medline (OVID), Embase, Web of Science and Cochrane, from inception – August 2020

ELIGIBILITY CRITERIA

- Children ≤18 years of age with retinoblastoma who underwent surgery for secondary cataract between 2000 – 2020, with minimum 6-month follow-up
- Peer-reviewed English-language publications focused on cataract surgery in children treated for RB, with ≥1 reported outcome

OUTCOME MEASURES

1. Visual
2. Refractive
3. Intraoperative findings
4. Complications
5. Intraocular recurrence
6. Globe salvage
7. Extraocular extension
8. Metastasis

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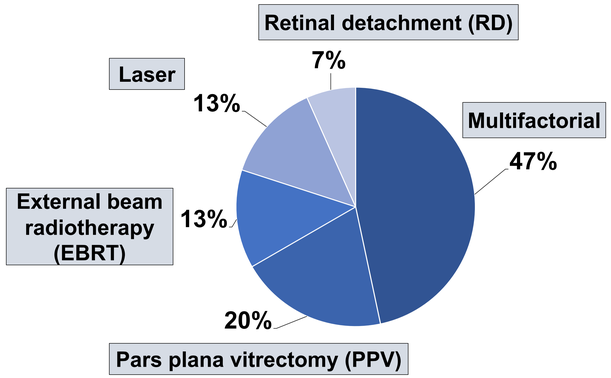
RESULTS

CASE SERIES

Retinoblastoma Demographics

- **15 eyes** of 15 children met inclusion criteria
- Mean age at diagnosis: 12 mo (median, 14; IQR, 4-19)
- RB laterality: bilateral (**93%**), unilateral (**7%**)
- Staging AJCC 8th Edition (study eye):
  - cT1: **26%**
  - cT2: **67%**
  - cT3: **7%**
  - H0*: **7%**
  - H1: **93%**

Figure 1. Primary Cataract Etiology



Cataract Characteristics

- Mean age at diagnosis: 39 mo (median, 31; IQR, 20-52)
- Morphology at diagnosis: posterior subcapsular (**87%**)

Details of Cataract Surgery

- Mean quiescent interval: 44 mo (median, 28; IQR, 15-64)
- Mean age: 79 mo (median, 64; IQR, 45-97)
- **73%** of children were monocular at the time of surgery

Table 1. Surgical Technique

Primary intraocular lens (IOL)	14 (**93%**)
Biometry	Immersion A-scan (**12**), Contact A-scan (**1**), IOL-Master (**1**)
IOL power formula	Holladay (**11**), Hoffer Q (**1**), unspecified (**2**)
Primary posterior capsulotomy (PPC)	6 (**40%**)
Anterior vitrectomy (AV)	5 (**33%**)
Combined with posterior segment surgery	2 (**13%**)

Intraoperative Findings

- Posterior synechiae (**4**)
- Anterior capsule fibrosis (**3**)
- Zonulopathy (**2**)
- Vitreous fibrosis/traction (**2**)
- Posterior capsule plaque (**1**)
- Retrolental membrane (**1**)

Visual Outcomes

- **100%** improved fundus view, **73%** (11/15) improved vision
- Final BCVA: 1.0 logMAR or better in 6 eyes (**40%**)
- Factors limiting VA: macular tumor/scar (**13**), chronic/previous RD (**9**), keratopathy (**5**), optic neuropathy (**4**), macular edema (**2**), chronic uveitis (**1**), amblyopia (**1**)

Refractive Outcomes

- Mean absolute predictive refractive error (n=6): 1.4±1.3 D

Table 2. Post-operative Ocular Complications

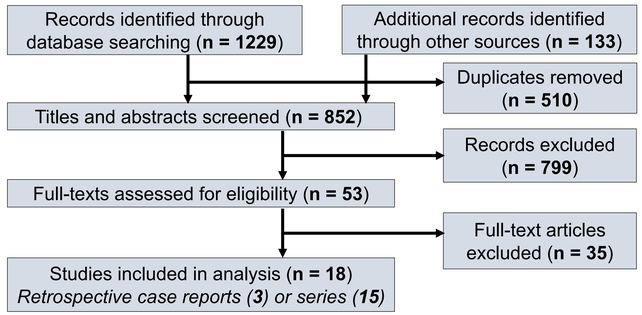
Visual axis opacification	11 (**73%**)
Capsular phimosis	5 (**33%**)
Zonulopathy	4 (**27%**)
Fibrin	3 (**20%**)
IOL decentration/tilt	2 (**14%**)
Macular edema	1 (**7%**)

Ocular and Systemic Outcomes

- Intraocular RB recurrence: 1 (**7%**)
  - Treated by PPV/tumor endoresection
- Globe salvage: 14 (**93%**)
  - 1 eye enucleated for chronic RD/phthisis bulbi
- No extraocular extension or metastases at mean 74 mo (median, 78; IQR, 29-126) follow-up.

SYSTEMATIC REVIEW

Figure 2. PRISMA Flow Diagram



Summary Outcomes

- Across all studies (**224 children**), intraocular recurrence occurred in **7%** of eyes and globe salvage achieved in **91%**
- Extraocular extension and metastasis reported in **<1%**

CONCLUSIONS

- Modern retinoblastoma therapies, including intravitreal chemotherapy and vitrectomy, cause secondary cataract.
- Following cataract surgery, intraocular RB recurrence risk is low and extraocular spread is rare.
- While surgery improves tumor visualization, macular tumors, RD, optic neuropathy and keratopathy limit visual prognosis.
- Challenges include biometry limitations and higher incidence of zonulopathy.

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