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Impact of Missed Red Reflex Screening on Binocular Vision Outcomes in a Child with Bilateral Congenital Cataracts

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Abstract

Delayed recognition of congenital cataracts during the critical period of visual development can result in permanent neurovisual deficits. This case report describes a 5-year-old child with bilateral congenital cataracts who presented late with alternating exotropia. Ocular evaluation showed bilateral cataracts, alternating fixation on cover testing, and absent stereopsis, indicating long-standing visual deprivation. Despite cataract extraction, binocular function remained poor due to disruption of cortical binocularity beyond the sensitive developmental window. This case underscores the irreversible impact of late intervention and highlights the need for strengthened neonatal red reflex screening and timely referral to prevent avoidable lifelong visual impairment.

1. Introduction

Congenital cataract is a rare yet preventable cause of childhood blindness, with a global prevalence of approximately 1-3 per 10,000 live births, and higher rates reported in low- and middle-income countries [1]. Globally, it is estimated that between 20,000 and 40,000 infants are born each year with congenital cataracts. Studies conducted in several Asian countries have shown that cataracts contribute to childhood blindness at varying rates, accounting for 22.3% in Malaysia, 27.3% in Bangladesh, 11.8% in China, and 15.8% in Indonesia [1].

The difference in these figures is likely influenced by many factors, such as the effectiveness of red reflex screening, access to pediatric ophthalmology services, parental awareness, referral systems, and regional differences in risk factors (e.g., maternal infections, genetic disorders, and metabolic diseases). Countries with lower apparent prevalence do not necessarily have lower incidence, but may have better early detection programs so that cases are treated before they cause blindness [1]. Differences in prevalence across regions may be attributed to variations in risk factors such as maternal infections, genetic disorders, and metabolic diseases. In this case, the bilateral presentation without a history of maternal infection is more suggestive of a hereditary etiology, although this could not be confirmed due to limitations in diagnostic testing [2].

Congenital cataracts interfere with the transmission of visual stimuli to the retina, disrupting visual cortex maturation during the highly sensitive developmental window within the first 3–6 months of life [2]. Visual deprivation during this period can lead to irreversible neurovisual deficits such as amblyopia, loss of stereopsis, and strabismus. Red reflex screening, using a direct ophthalmoscope within the first 72 hours of life, is a

simple, inexpensive, and highly sensitive (90–98%) tool for early detection of congenital cataracts. A repeat examination at 6–8 weeks is recommended as part of routine infant immunization visits [3]. When consistently implemented in primary care, early detection enables timely referral and surgical intervention, ideally before the sensitive window closes, thereby improving long-term visual outcomes.

However, despite clear recommendations, many low-resource settings still face challenges including inconsistent neonatal screening practices, inadequate training, and limited access to pediatric ophthalmology services [4]. These barriers often result in delayed diagnosis and late presentation, at which point binocular visual development may already be severely compromised. This case highlights the long-term neurovisual consequences of a missed red reflex in infancy and the subsequent delay in surgical management of bilateral congenital cataracts. The purpose of this case report is to describe how missed red reflex screening led to delayed intervention and resulted in persistent binocular vision impairment in a 5-year-old child.

2. Cases

A five-year-old boy was brought by his parents with complaints of blurred vision and difficulty reading at school, which the parents had noticed from his teacher at school since two months ago. The complaint was followed by glare at night, which the patient's parents had noticed for the past year. The patient was taken to a doctor and referred to an ophthalmologist for further examination. The patient is the fourth child of four siblings. He was born vaginally, cried immediately and loudly, and was active. His birth weight was 3000 grams, and his current weight is 30 kilograms. The patient's mother has no history of diabetes, hypertension, or other infections. There is no history of medication use during pregnancy. The patient was not syndromic and infectious screening including serum toxoplasmosis, cytomegalovirus, herpes and rubella were negative. The family was not keen to proceed with genetic studies. However, the patient's mother has a history of hypermetropia in both eyes.

Ocular examination confirmed bilateral congenital cataracts with no history of neonatal red reflex screening. From ophtalmological examination, we found that the palpebrae and conjunctiva were calm, there was neither conjunctival injection nor sillier injection. The cornea was clear and the anterior chamber was normal. The pupils measured 4 mm in diameter with positive of light reflex. Both lense was cloudy. Pre-operative visual acuity was assessed using an age-appropriate pediatric visual acuity chart through cooperative letter/symbol recognition at standard monocular testing distance, suitable for a cooperative 5-year-old child. Visual acuity was 1/60 on the right eye and 2/60 on the left eye, Hirschberg test showed exotropia 30° on the right eye, orthroporia sometimes, but Cover-Uncover test revealed alternating fixation shifts without evidence of stereopsis or binocular fusion (Figure 1). Biometric examination results on the right eye revealed an axial length of 20.02 mm and an IOL size of 29.0 dioptri, with a target refraction of 1.00 based on Enyedi's formula. Meanwhile, biometric examination results on the left eye revealed an axial length of 19.71 mm and an IOL size of 30.5 dioptri, with a target refraction of 1.00 based on Enyedi's formula. Posterior segment imaging was not performed due to limited patient cooperation, and is acknowledged as a case-specific evaluation limitation.

The patient was diagnosed with congenital cataracts and alternate exotropia in both eyes. Sequential surgery was chosen for pediatric intra-ocular safety, prioritizing the right eye due to slightly poorer initial visual response, with a two-week interval to confirm stable first-eye recovery before fellow-eye intervention. On july 16th, 2025, the patients underwent right-eye lens aspiration/irrigation (A/I), membranectomy, anterior vitrectomy (VA), and implantation of a 29.0 dioptri intraocular lens under general anesthesia (Figure 2). Following surgery, the patient was prescribed antibiotic eye drops (8 times daily) and anti-inflammatory eye drops (8 times daily) for the right eye. Systemic antibiotics were administered in the form of antibiotic syrup (125 mg twice daily), and oral analgesics syrup (120 mg three times daily).

On the first day of follow-up, bedside examination revealed intact hecting, minimal subconjunctival bleeding and clear cornea on the right eye with a best corrected visual acuity of 4/60. A week after, the patient came to the polyclinic for a check-up. On the left eye, there was a cloudy lense and a visual acuity progressively decreased to 1/60 and the patient was planned to the second cataract surgery on the left eye with the same technique as previously performed on the right eye two week ago with implantation of a 30.5 dioptri intraocular lens under general anesthesia.

One month after undergoing bilateral cataract surgery, a visual acuity assessment using a near vision test card revealed a visual acuity of 6/30 in both the right and left eyes. After refractive correction, the best corrected visual acuity in both eyes improved to 6/15, with a spherical correction of +1.50 at axis 175° in the right eye and +0.50 at axis 180° in the left eye. These findings indicate that

Figure 1. The clinical photos of ophthalmological examination. In the Hirschberg test, the right eye showed exotropia.

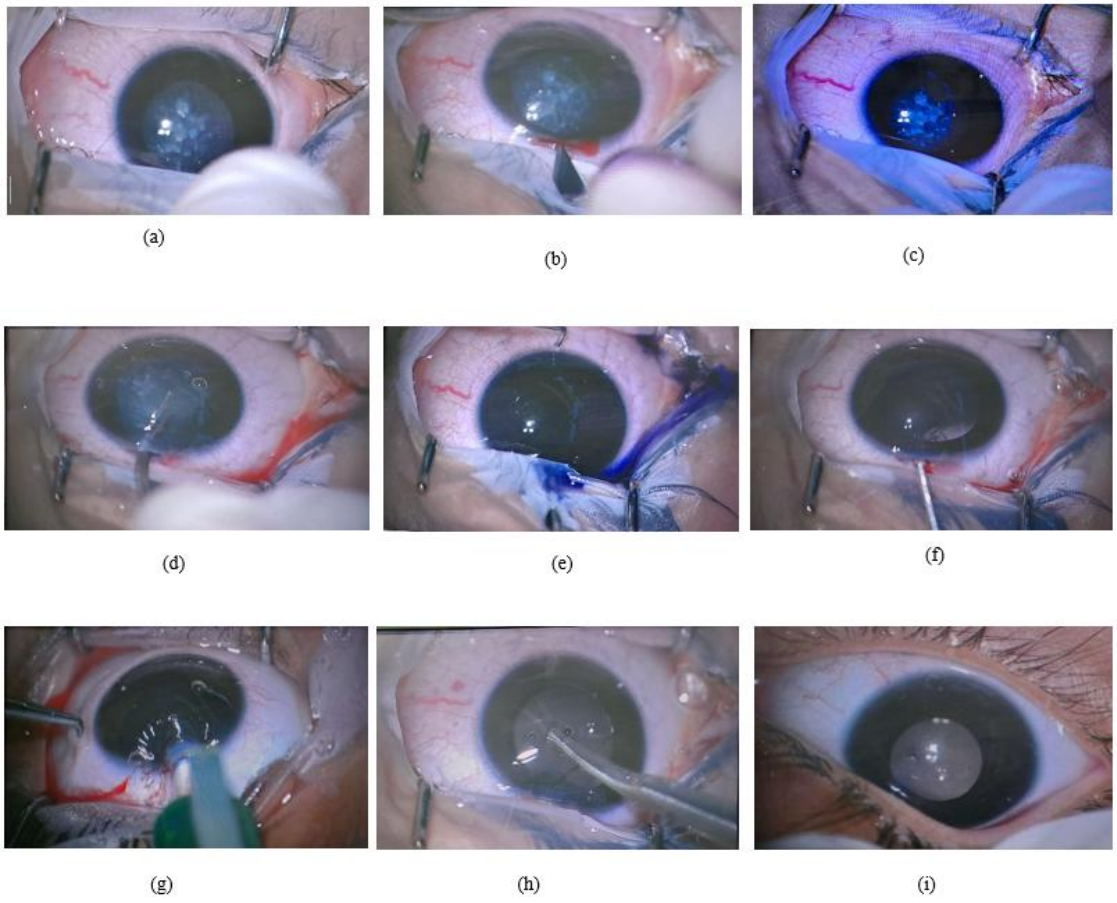

Figure 2. The clinical presentation in surgery (a) cloudy lens, (b) clear corneal incision, (c) Trypan blue staining and irrigation, (d) Continuous Curvilinear Capsulorhexis (CCC) and Hydrodesection, (e) lens aspiration/irrigation (A/I), (f) lens already clear, membranectomy, vitrectomy anterior, (g) implantation IOL, (h) procedure completed by 1 suture of nylon and air bubble in the COA, (i) The clinical presentation from oculi dextra post-operatively

the patient continued to moderate amblyopia postoperatively. However, full visual recovery to normal acuity was not achieved, most likely due to permanent amblyopia resulting from delayed intervention for congenital cataract. To further evaluate binocular visual function, a binocular single vision assessment was conducted using the TNO stereotest, which utilizes random dot stereograms. Additionally, the Worth Four Dot Test (WFDT) was performed with red-green glasses to detect any suppression. Based on these findings, occlusion therapy was prescribed by patching the dominant (right) eye for two hours daily. This intervention aims to stimulate the weaker (left) eye, enhance its neural visual pathway development, and gradually improve its visual acuity over time.

3. Discussions

In patients with blurred vision, this condition is primarily caused by lens opacity that disrupts normal light

refraction. Night glare occurs due to scattered light entering the pupil, reducing central and peripheral visual acuity [5]. Multiple factors contribute to congenital cataracts, including intrauterine infections, radiation exposure during pregnancy, maternal medication use, and genetic or metabolic abnormalities, although in many cases the exact etiology remains unknown [6].

During ophthalmological evaluation, both lenses were found to be cloudy, with a visual acuity of VODS 2/60. The patient could recognize objects clearly only at a distance of 2 meters, compared to 60 meters in normal vision. This severe reduction in acuity reflected the failure of a clear retinal image to form, leading to visual deprivation amblyopia during the sensitive period of cortical development. This condition arises when visual input is inadequate, resulting in impaired formation of essential neural connections [6]. The Hirschberg test indicated orthophoria, commonly observed in bilateral congenital cataract, while the cover–uncover test showed alternating fixation shifts. This suggested no dominant eye, as both eyes had similar levels of visual impairment, preventing suppression and allowing apparent orthophoria in primary gaze.

Postoperatively, visual recovery differed between eyes, with the right eye showing greater improvement. Binocular single vision assessment via TNO demonstrated poor stereopsis, indicating impaired binocular integration potentially due to amblyopia, suppression, strabismus, visual deprivation, or significant anisometropia. Larger interocular acuity differences correlate with poorer stereopsis. Additional factors influencing stereopsis include cataract type, surgical technique, IOL implantation status, age at surgery, and preoperative vision. The Worth Four Dot Test (WFDT) revealed left-eye suppression, reflecting longstanding amblyopia and impaired fusion mechanisms [7].

Recovery from amblyopia relies heavily on neuroplasticity within the visual cortex. Neuroplastic responses are greatest early in life, particularly during the critical period, which informs the urgency of early intervention for amblyopia [8]. Despite surgical correction, this patient continued to exhibit persistent alternate exotropia and suboptimal vision, consistent with irreversible disruption of cortical development. Cortical binocularity begins to form within weeks after birth, and deprivation beyond 8–12 weeks can produce permanent deficits even after anatomical correction. Strabismus in this case reflects a failure in binocular integration caused by delayed intervention. Although post-surgical binocular rehabilitation may provide partial improvement, adherence challenges and variable treatment responses limit functional recovery [8]. The most recent pediatric cataract cohort data (2025) indicate that among patients with preoperative ocular deviation, approximately 40–50% achieved orthotropia after surgery, while the remainder either continued to have deviations or developed new strabismus [9]. Factors influencing these outcomes include the age at surgery, duration of visual deprivation prior to intervention, presence of amblyopia, and adherence to postoperative therapy. In our case, the patient was 5 years old at the time of surgery, well beyond the critical 3–6 month period for visual development, with established deprivation amblyopia. Therefore, the risk of persistent alternating exotropia observed in this patient is consistent with the cohort findings. This analysis underscores that delayed diagnosis and intervention not only affect visual acuity but also impact binocular integration and the likelihood of postoperative strabismus resolution. This case reinforces the developmental urgency associated with congenital cataracts, where delayed detection can lead to lifelong visual dysfunction.

Evidence demonstrates that universal red reflex screening increases early referral rates up to ninefold, although implementation remains inconsistent in low-resource settings. The red reflex test is quick, inexpensive, and noninvasive, capable of detecting visual axis opacities or asymmetry that may indicate serious ocular abnormalities. Routine screening from birth and at every healthcare visit is strongly recommended, with immediate referral if the reflex appears dim, white, or asymmetric [10, 11].

To prevent delays like those observed in this case, standardized red reflex screening in primary care is essential. Proper technique includes performing the test in a dim room at a distance of 30–45 cm, assessing both eyes simultaneously (Bruckner test), and referring urgently if reflexes lack the typical bright, symmetrical red appearance or if functional vision is below age expectations. Parents must also be educated that red reflex screening is not definitive; mild cataracts may require dilation or imaging. Nevertheless, it remains the most effective initial tool for preventing amblyopia and irreversible binocular vision impairment [12]. In this patient, long-term postoperative follow-up has been scheduled as part of the continuing care pathway to monitor amblyopia therapy response, ocular alignment stability, suppression status, and progressive visual function, as these outcomes evolve beyond the early postoperative period.

This case answers the research question by demonstrating that a missed neonatal red reflex screening can lead to delayed cataract detection, postponed surgical intervention, and ultimately

persistent binocular vision deficits. The main discoveries include persistent alternate exotropia, asymmetric postoperative visual recovery, left-eye suppression, and absent stereopsis despite cataract extraction. These findings align with prior studies emphasizing the necessity of early detection and support evidence that surgery performed after the critical period yields poorer binocular outcomes. An unexpected aspect of this case was the persistence of alternating exotropia despite symmetrical cataract severity, contrasting with other reports where bilateral cataract patients regained orthotropia following surgery.

This report is limited by its single-case nature, lack of long-term follow-up, and limited generalizability. Even so, the case highlights the public health significance of early red reflex screening in preventing lifelong visual disability. Its novelty lies in illustrating a real-world pathway from missed screening to irreversible binocular impairment in a school-aged child. Further research should explore barriers to screening adherence, evaluate referral pathways in primary care, and compare binocular outcomes between early and late surgical cohorts.

4. Conclusions

Delayed detection of bilateral congenital cataracts in this case demonstrated that a missed red reflex screening led to postponed surgery and irreversible disruption of cortical binocularity, directly illustrating the consequences of late intervention. Despite anatomical correction, the child showed persistent alternated exotropia, asymmetric visual recovery, and severely impaired stereopsis findings, while consistent with existing literature, highlight the unexpected persistence of strabismus even with symmetrical cataract severity. This report underscores how a single missed screening opportunity can result in long-term functional vision loss, emphasizing the importance of timely detection in pediatric eye care. While based on a single case, these observations suggest avenues for future research into barriers to early referral and screening adherence in pediatric cataract management.

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References

1. Tariq, M., Uddin, Q., Ahmed, B., Sheikh, S., Ali, U., and Mohiuddin, A. (2022). Prevalence of Pediatric Cataract in Asia: A Systematic Review and Meta-Analysis, *Journal of Current Ophthalmology*, Vol. 34, No. 2, 148. doi:10.4103/joco.joco_339_21.
2. Bell, S. J., Oluonye, N., Harding, P., and Moosajee, M. (2020). Congenital Cataract: A Guide to Genetic and Clinical Management, *Therapeutic Advances in Rare Disease*, Vol. 1. doi:10.1177/2633004020938061.
3. Subhi, Y., Schmidt, D. C., Al-Bakri, M., Bach-Holm, D., and Kessel, L. (2021). Diagnostic Test Accuracy of the Red Reflex Test for Ocular Pathology in Infants, *JAMA Ophthalmology*, Vol. 139, No. 1, 33. doi:10.1001/jamaophthalmol.2020.4854.
4. Lenhart, P. D., and Lambert, S. R. (2022). Current Management of Infantile Cataracts, *Survey of Ophthalmology*, Vol. 67, No. 5, 1476–1505. doi:10.1016/j.survophthal.2022.03.005.
5. Arias, A., Montagud-Martinez, D., and Artal, P. (2024). Effects of Intraocular Scatter on near Peripheral Vision, *Biomedical Optics Express*, Vol. 15, No. 4, 2517. doi:10.1364/BOE.523715.
6. Hailaiti, A., Yu, X., Yao, K., and Shentu, X. (2025). Postoperative Amblyopia in Children with Congenital Cataracts: A Systematic Review and Meta-Analysis, *Italian Journal of Pediatrics*, Vol. 51, No. 1, 141. doi:10.1186/s13052-025-02010-x.
7. Shiraishi, Y., Wakayama, A., Matsumoto, F., Tanabe, F., and Kusaka, S. (2023). The Association Between Improvement of Stereoacuity and Suppression in the Treatment of Anisometropic Amblyopia, *Clinical Ophthalmology*, Vol. Volume 17, 1545–1553. doi:10.2147/OPTH.S412194.
8. Thompson, B., Concetta Morrone, M., Bex, P., Lozama, A., and Sabel, B. A. (2024). Harnessing Brain Plasticity to Improve Binocular Vision in Amblyopia: An Evidence-Based Update, *European Journal of Ophthalmology*, Vol. 34, No. 4, 901–912. doi:10.1177/11206721231187426.
9. Genç Bozhöyük, G., Rustamlı, N., Bingöl Kızıltunç, P., and Atilla, H. (2025). Strabismus Accompanying Pediatric Cataracts and the Effect of Cataract Surgery on Strabismus, *Turkish Journal of Ophthalmology*, Vol. 55, No. 1, 24–28. doi:10.4274/tjo.galenos.2025.63060.
10. Hutchinson, A. K., Morse, C. L., Hercinovic, A., Cruz, O. A., Sprunger, D. T., Repka, M. X., Lambert, S. R., and Wallace, D. K. (2023). Pediatric Eye Evaluations Preferred Practice Pattern, *Ophthalmology*, Vol. 130, No. 3, P222–P270. doi:10.1016/j.ophtha.2022.10.030.
11. Pediatrics, A. A. of, and Strabismus, A. A. for P. O. and. (2022). Vision Screening for Infants and Children, American Association for Pediatric Ophthalmology and Strabismus, from http://mypedeyedr.com/clients/18009/documents/Vision_Screening_for_Inf.
12. Toli, A., Perente, A., and Labiris, G. (2021). Evaluation of the Red Reflex: An Overview for the Pediatrician, *World Journal of Methodology*, Vol. 11, No. 5, 263–277. doi:10.5662/wjm.v11.i5.263.