Biomedical Journal of Indonesia
Journal Homepage: https://bji-fk.ejournal.unsri.ac.id

Short Eyes, Blurred Vision: A Case of Axial High Hyperopia and Suspected Amblyopia in Childhood

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ARTICLE INFO

Keywords:
High hypermetropia
Amblyopia
Management

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All authors have reviewed and approved the final version of the manuscript.

https://doi.org/10.32539/BJI.v12i3.385

ABSTRACT

Introduction. Hypermetropia is a common refractive error in children that, when significant, may impair visual function and increase the risk of amblyopia and strabismus. Amblyopia is a developmental visual disorder characterized by reduced best-corrected visual acuity due to abnormal visual experience during childhood. Early identification and appropriate refractive correction are important for maximizing visual development. Such cases may have reduced visual acuity despite initial refractive correction. This report describes the management of high hypermetropia with suspected bilateral ametropic amblyopia and aims to improve best-corrected visual acuity through proper correction. **Methods.** An 8-year-old student presenting with bilateral blurred vision for two months, aggravated by reading and mobile phone use, underwent ophthalmological assessment, including visual acuity measurement, pinhole testing, cycloplegic refraction, and crowding testing. Symptoms, daily screen exposure, spectacle prescription, and visual acuity at one-month follow-up were documented. **Results.** The patient reported no diplopia, squinting, redness, or watering of the eyes. The mother reported mobile phone use exceeding six hours daily without breaks. Initial visual acuity was 6/30 in both eyes, improving to 6/21 with pinhole testing. Cycloplegic refraction revealed +5.25 D spherical in both eyes, improving visual acuity to 6/18 and to 6/15 on crowding testing. The patient was prescribed +5.00 D spherical spectacles bilaterally. At one month, best-corrected visual acuity improved from 6/18 to 6/15. **Conclusion.** High hypermetropia with suspected bilateral ametropic amblyopia requires appropriate refractive correction and regular follow-up. Improved visual acuity after spectacle correction demonstrates potential visual benefit. Continued monitoring remains important to assess visual development.

1. Introduction

Refractive errors, including myopia, hypermetropia, and astigmatism, are a major cause of visual impairment worldwide. Uncorrected refractive error is the leading cause of vision impairment in children and adults. Hypermetropia is a condition where distant parallel rays are insufficiently refracted, placing the focal point behind the retina.[1–3] Hypermetropia is relatively common in children, with a recent systematic review reporting a pooled prevalence of 6.33% among children aged 5–17 years in the Eastern Mediterranean Region.[4] Hypermetropia is typically bilateral, but some cases may be unilateral, increasing the risk of anisometropic amblyopia and strabismus development.[5] Hypermetropia is categorized by refractive error magnitude: mild (+0.00 to +3.00 D), moderate (+3.12 to +5.00 D), and high (above +5.00 D). WHO reports hypermetropia in 30.6% of adults and 4.6% of children. High hypermetropia poses risks, including amblyopia, where optimal sharp vision isn't achieved despite refractive error correction.[6]

Amblyopia is a developmental visual disorder characterized by reduced best-corrected visual acuity in one eye or both, resulting from abnormal visual experience during early childhood.[7] A global pooled prevalence of amblyopia in children is approximately 1.36%.[8] Risk factors for amblyopia include strabismus, anisometropia, significant hypermetropia, astigmatism, and other conditions. In particular, the presence and severity of hyperopia have been associated with higher rates of amblyopia and strabismus in children, with greater hyperopia associated with greater impairment of visual function.[9,10] Hypermetropia management aims for effective rehabilitation through proper refractive correction, averting amblyopia and strabismus and

improving visual development. Early recognition and appropriate refractive correction are particularly important in children with significant hypermetropia. This case report describes the prescribing decisions in a case of high hypermetropia with presumed amblyopia and highlights the chosen interventions.

2. Case Presentation Section

An 8-year-old student, referred to as R, attended the RSMH's eye clinic with a two-month history of blurred vision in both eyes. The complaint is particularly noticeable during activities like reading books, using mobile phones, and writing. RSMH's refraction, contact lens, and low vision department were consulted for evaluation. The child was brought in by parents due to persistent complaints, specifically related to blurred vision during book reading and blackboard viewing. The mother admitted to the child's prolonged daily mobile phone use indoors, exceeding 6 hours without breaks. Notably, there are no associated symptoms such as double vision, squint, redness, or watery eyes.

During the physical examination, vital signs were within normal limits. The ophthalmology examination of the anterior segment (Figure 1) showed orthophoric eyeball position and no other abnormalities. The ophthalmologic assessment revealed a visual acuity of 6/30 ph 6/21 in both eyes (ODS). Trial lens correction without cycloplegia resulted in S+4.75 C, achieving a visual acuity of 6/21. Following cycloplegic refraction, correction with +5.25 D sphere improved visual acuity to 6/18 in both eyes. During the subsequent crowding assessment, visual acuity was recorded as 6/15. The crowding assessment was performed as part of the evaluation of visual function in the context of suspected amblyopia. Binocular vision was measured at 6/18 with a 60 mm pupil distance.

The pre-cycloplegic autorefraction and keratometry examination revealed the findings of OD (right eye) as +4.75 C +0.25 x 93o and OS (left eye) as +4.75 C +0.25 x 135°. Post-cycloplegic results showed an adjustment to +5.25 for both OD and OS, with OS additionally having a cylindrical correction of -0.50 x 37. Near vision examination resulted in a visual acuity of 6/40 for both eyes. Retinoscopy examination indicated S+5.00 D for both OD and OS. The Amplitude of Accommodation examination, using spherical lenses OD 9 and OS 7, was conducted. Glasses correction was prescribed as S+5.00 for OD, achieving a visual acuity of 6/18, and for OS with the same prescription, also achieving a visual acuity of 6/18. Posterior segment examination was found to be normal in both eyes (Figure 3). The posterior segment revealed normal findings of oval-shaped papillae with firm borders, normal red coloration, c/d 0.3, a:v=2:3, and a healthy macula with normal foveal reflexes and normal contour of the vascular pattern. Bilateral ocular ultrasonography (Figure 2) confirmed structural integrity and findings on fundoscopic examinations.

The patient's diagnosis, given history, physical examination, and additional evidence, is as follows: high hypermetropia in the right (oculus dexter) and left eye (oculus sinister) and suspected bilateral ametropic amblyopia. The suspicion of amblyopia was raised due to the suspicion of bilateral high hypermetropia and suboptimal visual acuity despite attempted correction through the use of spectacles, without any abnormalities seen on anterior and posterior segment examinations or ocular ultrasonography. Management includes refractive correction through the use of positive spherical glasses for both eyes (ODS). This approach aims to address hypermetropia and improve visual acuity, particularly targeting the amblyopic condition. At the 1-month follow-up, the patient showed improvement, progressing from an initial sharp vision of 6/18 to 6/15 with the best correction.



Figure 1. Ophthalmology examination for the anterior segment

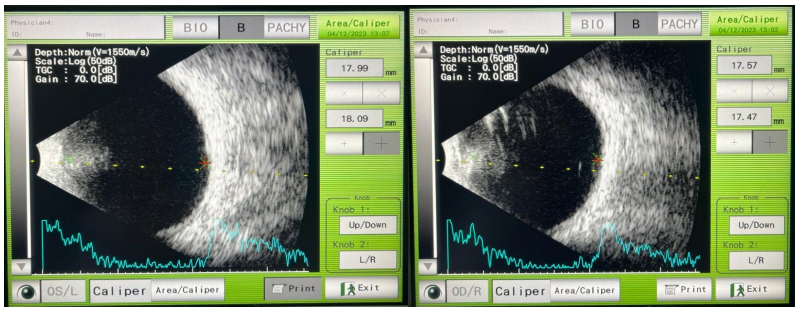


Figure 2. Ultrasound of both eyes (Left: Left Eye and Right: Right Eye) reveals vitreous echo-free, retina intact, choroid not thickened, axial length OD 17.57 mm and OS 17.99 mm



Figure 3. Funduscopic examination: ODS within normal limits

3. Discussion

High hypermetropia in children is clinically important because a substantial refractive error can produce persistent retinal image defocus during the critical period of visual development and consequently increase the risk of amblyopia and strabismus. In the present case, the bilateral hypermetropia of +5.00 D was accompanied by reduced visual acuity that remained suboptimal after refractive correction, raising clinical suspicion of refractive amblyopia. The absence of apparent structural abnormalities on posterior segment examination and ocular ultrasonography further supports the consideration of a developmental visual deficit rather than an identifiable structural cause of reduced visual acuity.[9]

The patient exhibits high hypermetropia (S + 5.00) in both eyes, resulting in 6/18 visual acuity, improving to 6/15 with a crowding test. Anatomically, the patient is classified as having axial hypermetropia, evident in shortened axial lengths (17.57 mm in the right eye and 17.99 mm in the left eye), increasing the likelihood of hypermetropia.[1,6] During the crowding test, reduced visual performance in the presence of surrounding contours was observed. The crowding test, as per the literature, involves the combined effects of contour interaction, relative inaccuracies in vision control, and attention factors. Contour interaction refers to the specific effect resulting from contour proximity to near vision, occurring alternately between eyes.[11] In amblyopia, the ability to distinguish a target from surrounding visual information may be impaired because visual signals from the target and adjacent contours are integrated less selectively. As a result, the surrounding contours can interfere with target identification and reduce visual performance when optotypes are presented in a crowded arrangement. Recent evidence indicates that crowding also occurs in foveal vision in children with amblyopia and may reflect abnormal pooling of visual information from the target and surrounding elements.[11,12] The reduced or altered visual performance observed during crowded presentation in this case may be related to impaired visual integration associated with amblyopia rather than solely to optical blur from hypermetropia.[13,14] Therefore, the crowding response in this case should be interpreted as a finding that supports the assessment of visual function rather than as an independent diagnostic criterion for amblyopia.

Hypermetropia symptoms can manifest asymptomatically or symptomatically, varying with age and degree of hypermetropia. Clinical presentations range from no symptoms to diverse complaints. Age plays a crucial role, affecting both expressive ability and accommodative efforts. In children, the relatively strong accommodative capacity can partially compensate for hypermetropia by increasing accommodative effort to maintain a clear retinal image. However, as the degree of hypermetropia increases, the accommodative demand also increases, particularly during near tasks, which may contribute to visual discomfort and reduced visual function.[9] Moderate to high hypermetropia may exhibit signs such as a small eyeball due to shortened axial length. Symptoms in this patient include distant blur, which may be related

to the increased accommodative demand associated with hypermetropia, particularly during prolonged near-work activities such as reading. Uncorrected hypermetropia may lead to amblyopia, especially with a significant difference between eyes, potentially causing bilateral ametropic amblyopia.[1,5,12] The prolonged accommodative effort required to compensate for hypermetropia may become unstable after sustained near work. In susceptible individuals, excessive or persistent activation of the accommodative mechanism can result in incomplete relaxation of the ciliary muscle when shifting fixation from near to distance. This can produce a transient increase in ocular refractive power and a temporary myopic shift, which is referred to as pseudomyopia. Thus, the episodes of blurred distance vision described in this patient may be explained by the interaction between the high hyperopic refractive error, increased accommodative demand, and accommodative instability following prolonged near work. However, it should be clinically confirmed that accommodative spasm is the case, especially with a cycloplegic refraction, rather than assuming it from hypermetropia or prolonged near work.[15,16]

The suspected ametropic amblyopia was considered based on the presence of significant and relatively symmetrical bilateral hypermetropia, with visual acuity remaining suboptimal despite refractive correction. The term 'isometropic amblyopia' applies best to decreased visual acuity with significant bilateral refractive error without a substantial interocular refractive difference. The diagnosis should not be based on the presence of crowding phenomenon by itself, because the crowding phenomenon is a visual phenomenon, potentially related to amblyopia, but not determined by its etiology. In this patient, the absence of abnormalities on anterior and posterior segment examinations and ocular ultrasonography, together with the bilateral and relatively symmetrical refractive error, supports a refractive/developmental explanation for the reduced visual acuity. However, the diagnosis of amblyopia remains a clinical diagnosis based on best-corrected visual acuity and exclusion of other causes of reduced vision.[17]

In managing this 8-year-old patient with a diagnosis of high hypermetropia and suspected amblyopia, refractive correction with positive spherical lenses was prescribed based on the patient's refractive error, visual acuity, and clinical findings. Treatment of refractive error alone is the initial step in the care of children 0 through 17 years of age with amblyopia. Visual acuity of children who have bilateral refractive amblyopia can also substantially improve with refractive correction alone.

No strabismus was observed during the examination. At the 1-month follow-up, the patient showed improvement, progressing from an initial sharp vision of 6/18 to 6/15 with the best correction. Ongoing monitoring and appropriate management aim to achieve maximum visual acuity for the patient.[1,5,12] The improvement in visual acuity can be explained by the effect of refractive correction in providing a clearer retinal image and reducing the optical component of visual blur. According to the Amblyopia Preferred Practice Pattern, improvement in visual acuity can occur following correction of the refractive error, although visual acuity may remain subnormal when an amblyogenic developmental component is present. Continued use of the appropriate refractive correction may therefore provide an opportunity for further visual improvement in children with refractive amblyopia.[17]

4. Conclusion

In our case, hypermetropia was managed with full refractive correction using the strongest spherical lenses based on the patient's refractive findings. Given the suspected bilateral refractive amblyopia, regular follow-up was advised to monitor visual development and treatment response. At the 1-month follow-up, visual acuity improved from 6/18 to 6/15 with the best correction.

5. Author Contribution

N.O. was involved in the clinical management of the patient, performed the literature review, and drafted the manuscript. A.I. and E.K. supervised clinical management and critically reviewed the manuscript for important intellectual content. All authors read and approved the final manuscript. Verbal informed consent for publication of the case report and accompanying periocular/facial photographs was obtained from the patient's parent/legal guardian.

6. Acknowledgements

The authors thank the Department of Ophthalmology, Faculty of Medicine, Sriwijaya University, and the refraction, contact lens, and low vision department at RSMH for their support in this case.

7. References

1. Cantor L, Rapuano C, Cioffi G. Clinical Optics. San Francisco: American Academy of Ophthalmology; 2021.
2. Mavi S, Chan V, Virgili G, Biagini I, Congdon N, Piyasena P. The Impact of Hyperopia on Academic Performance Among Children: A Systematic Review. Asia-Pacific J Ophthalmol. 2022;11(1):36–51.
3. Rosenfield M. Refractive Status of the Eye. In: Butterworth H, editor. Borish's Clinical Refraction. 2nd ed. USA: Elsevier; 2006. p. 9–11.
4. Mukherjeen P. Manual Optics and Refraction. In: Comprehensive Ophthalmology. 4th ed. New Delhi: Jaypee Brothers Medical Publishers; 2015. p. 72–7.
5. Khurana A. Optics and Refraction. In: Comprehensive Ophthalmology. 4th ed. New

Delhi: New Age International Publisher; 2017. p. 38–9.
6. Yuliana J. Aspek Klinis Ambliopia. Cermin Dunia Kedokteran. 2022 Jan 3;49(1):19–22. doi:10.55175/cdk.v49i1.182
7. Hu B, Liu Z, Zhao J, Zeng L, Hao G, Shui D, et al. The Global Prevalence of Amblyopia in Children: A Systematic Review and Meta-Analysis. Front Pediatr. 2022 May 4;10. doi:10.3389/fped.2022.819998
8. Kulp MT, Ciner E, Ying G, Shuang, Candy TR, Moore BD, Orel-Bixler D. Vision Screening, Vision Disorders, and Impacts of Hyperopia in Young Children: Outcomes of the Vision in Preschoolers (VIP) and Vision in Preschoolers – Hyperopia in Preschoolers (VIP-HIP) Studies. Asia-Pacific Journal of Ophthalmology. 2022 Jan;11(1):52–8. doi:10.1097/APO.0000000000000483
9. Plasencia CR, Plasencia JP, García CC, Caballero-Alvarado J, Zavaleta-Corvera C. Risk factors associated with amblyopia in children: a case-control study. Russian Annals of Ophthalmology. 2026 Aug 18;142(4):46. doi:10.17116/oftalma202614204146
10. Blair K, Zeppieri M, Gulani AC. Amblyopia. 2024. PubMed PMID: 28613640.
11. Kalpadakis-Smith A V., Tailor VK, Dahlmann-Noor AH, Greenwood JA. Crowding changes appearance systematically in peripheral, amblyopic, and developing vision. J Vis. 2022 May 4;22(6):3. doi:10.1167/jov.22.6.3
12. Waugh SJ, Fronius M. Landolt C-Tests With "Fixed" Arcmin Separations Detect Amblyopia But Underestimate Crowding in Moderate-to-Severe Amblyopic Children and Adults. Invest Ophthalmol Vis Sci. 2024 Aug 23;65(10):33. doi:10.1167/iovs.65.10.33
13. Majumdar S, Tripathy K. Hyperopia. 2023. PubMed PMID: 32809551.
14. García-Montero M, Felipe-Márquez G, Arriola-Villalobos P, Garzón N. Pseudomyopia: A Review. Vision. 2022 Mar 4;6(1):17. doi:10.3390/vision6010017
15. Manna P, Karmakar S, Bhardwaj GK, Mondal A. Accommodative spasm and its different treatment approaches: A systematic review. Eur J Ophthalmol. 2023 May 16;33(3):1273–86. doi:10.1177/11206721221136438
16. Hutchinson AK, Morse CL, Hercinovic A, Cruz OA, Sprunger DT, Repka MX, et al. Pediatric Eye Evaluations Preferred Practice Pattern. Ophthalmology. 2023 Mar;130(3):P222–70. doi:10.1016/j.ophtha.2022.10.030. PubMed PMID: 36543602.
17. Cruz OA, Repka MX, Hercinovic A, Cotter SA, Lambert SR, Hutchinson AK, et al. Amblyopia Preferred Practice Pattern. Ophthalmology. 2023 Mar;130(3):P136–78. doi:10.1016/j.ophtha.2022.11.003