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Case Report

Is It Truly Myopia or Pseudomyopia?: A Case Report of a Pediatric Patient

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ABSTRACT

Introduction: Pseudomyopia, resulting from excessive accommodation or nerve-related effects, creates false myopia corrected by cycloplegic refraction, which differs from secondary myopia caused by identifiable factors such as cataracts or trauma. If underlying hyperopia remains undetected, symptoms such as asthenopia and headaches occur, potentially resulting in conditions such as amblyopia. We presented a case of pseudomyopia in a pediatric patient to describe its clinical features and treatment.

Case Presentation: A 7-year-old patient, who often uses smartphones for approximately 1–3 h daily in a well-lit room, initially reported blurry distant vision, headaches, eye discomfort, and difficulty reading from a distance. At the first visit, the visual acuity of the right (oculus dexter, OD) and left (oculus sinister, OS) eyes was 6/18 and 6/24, respectively. A cycloplegic was administered to both eyes, and subjective refraction of OD S +1.00 and OS S +1.25 was obtained. The patient was diagnosed with pseudomyopia and was administered glasses treatment and cycloplegic topical eye drops. After 12 weeks of treatment, the best-corrected visual acuity was 6/6.

Conclusion: Pseudomyopia clinical features in pediatric patients could vary and should be distinguished from accommodative spasms. Treatment approaches vary widely, reflecting the lack of consensus on management despite consistent assessment and diagnostic approaches.

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INTRODUCTION

Pseudomyopia comes from the Greek words "pseudes," meaning false or erroneous, and "myopia," which is defined by the International Myopia Institute as a refractive defect where light rays that enter the eye parallel to the optic axis are focused in front of the retina while eye accommodation is at rest. Nevertheless, it is crucial to differentiate pseudomyopia from the term "secondary myopia," which encompasses temporary nearsightedness shifts produced by changes in the refractive index of the lens due to cataracts [1–5].

Pseudomyopia manifests as a false myopia that can be corrected. A failure to identify the underlying hyperopia might result in asthenopia, eye strain, and persistent headaches [4,5]. It arises from the increasing refractive power of the eyes caused by an overstimulation of its accommodative mechanism. Because of continuous overactivity or other nerve-related effects, the ciliary muscle exhibits incomplete relaxation when attempting to focus on things at an infinite optical distance [1,6]. Consequently, accommodation does not relax at this point and can be eliminated by complete cycloplegic refraction. The distinction between noncycloplegic and cycloplegic refraction is a diagnostic sign of pseudomyopia [7,8].

A study conducted in Anyang, China, examined groups of 2612 and 1984 children aged 6 and 13 years, respectively, and found that the prevalence of pseudomyopia in these age groups was 24.1% and 18.9%, respectively [9]. Another study of 50 young Norwegian adults (aged 18–40 years) reported a 7%

prevalence of pseudomyopia among the participants [10]. Furthermore, pseudomyopia is more prevalent in children; however, it tends to decrease with age because of the difference in accommodation between children and adults. Children have a very high amplitude of accommodation. At the age of 8 years, the child has an amplitude of accommodation of 14 (+/−2) diopters. As age progresses, the amplitude of accommodation decreases. The accommodation capacity will decrease by approximately 1 diopter every 4 years; therefore, by 40 years old, a person's amplitude of accommodation will remain at 6 (+/−2) diopters and will decrease further thereafter. The incidence of pseudomyopia is approximately 24% and 18% in 6-year-olds and 13-year-olds, respectively. This rate is expected to rise because children and adults spend more time on electronic devices such as smartphones, tablets, and laptops [11,12]. If untreated, complications such as refractive amblyopia could occur after diagnosis [7].

An observational study by Wang *et al.* (2020) reported that pseudomyopia was more common in younger children with a higher degree of hyperopia and subjected to autorefraction before and after cycloplegia. Pseudomyopia does not independently contribute to the risk of myopic development [9]. Although there is consensus regarding the assessment and diagnosis of pseudomyopia, a literature review reported that there is still a lack of agreement on its management, and the literature presents various therapeutic options, even though there is no difference between adult and pediatric patients [13]. We presented a case of pseudomyopia in a pediatric patient to describe its clinical features and treatment to increase awareness of eye accommodation disorders and to conduct routine examinations with a cycloplegic to avoid misdiagnosis.

CASE PRESENTATION

Case Presentation

A 7-year-old girl came to the clinic with complaints of frequent headaches, eye discomfort, and difficulty seeing objects from a distance in both eyes. Patients often use smartphones for an average of 1–3 h daily in a well-lit room. Family history revealed that the mother had never used glasses. The patient had never previously worn glasses.

Investigation

At the first visit (**Table 1**), the patient's visual acuity (VA) of the right (oculus dexter, OD) and left (oculus sinister, OS) eyes was 6/18 and 6/24, respectively. The subjective refraction examination results revealed OD S −4.50 C −1.50 × 90, and the patient's best-corrected VA (BCVA) was 6/12, not improved with pinhole. For OS, the subjective refraction examination revealed S −5.00 C −1.00 × 125, and the patient's BCVA was 6/12; however, after pinhole, the patient's BCVA improved to 6/9. Cyclopentolate 2% was administered to both eyes, and the subjective refraction for OD and OS was S +1.00 and S +1.25, respectively. Anterior and posterior segment examinations were within normal limits (**Fig.1**). The patient was administered eye lubricant 6 times for both eyes to relieve eye discomfort, advised to minimize smartphone use and near-vision tasks, and scheduled for follow-up in 2 weeks.

Treatment

After 2 weeks of observation, the VA of both eyes was 6/12 (**Table 1**). The results of objective refraction examination using an autorefractometer in both eyes showed negative sphere results, and postcycloplegic subjective refraction revealed positive sphere results OD S +0.75 and OS S +0.75 C −0.50 × 150. We provided glass therapy OD S +0.75 and OS S +0.75 C −0.50 × 180, which gave the best and most comfortable vision after postcycloplegic examination.

Outcomes and Follow-up

At the third and fourth visits, the VA of both eyes were 6/6 (**Table 1**). Subjective refraction still showed a positive sphere in both eyes. Glasses therapy was adequate; hence, BCVA 6/6 for both eyes was obtained. We recommended the patient to use the prescribed glasses for 1 year while performing monthly check-ups for the patient's refraction.

DISCUSSION

We report a case of a 7-year-old patient whose examination revealed differences between manifest and cycloplegic refraction. Manifest refraction showed myopia, whereas cycloplegic refraction showed hyperopia. It meets the criteria for pseudomyopia. Pseudomyopia is frequently misdiagnosed because of its resemblance to true myopia. The symptoms—blurred distance vision, difficulties in focusing, and a need for frequent prescription changes—often mimic those of actual nearsightedness. This misdiagnosis occurs because the condition is not always recognized as a temporary issue related to excessive accommodation rather than a structural change in the eye [13].

There are two types of pseudomyopia. The first emerges because of the persistent accommodative stress in young individuals with hyperopia while performing near work, which leads to an elevation in the tone of the ciliary muscle. The second occurs because of pathological severity and duration [14]. Pseudomyopia

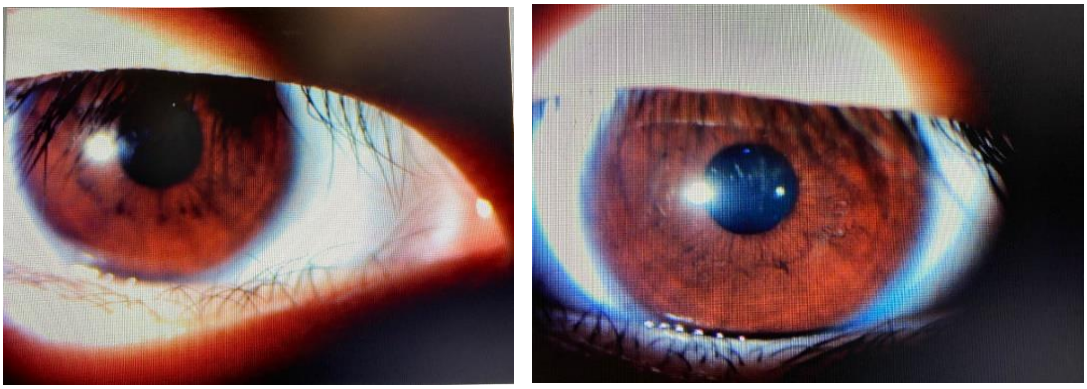


Fig. 1. Anterior Segment Examination Revealed Normal Findings in Both Eyes

develops when the cycloplegic refraction is lower than the manifest refraction, and standard refraction methods have difficulty effectively relaxing the eye's focusing ability at a distant point [3]. Accommodative spasms are characterized primarily by visual impairment for objects at both close and far distances, frontal headaches, light or glare sensitivity, eyestrain during close-up tasks, eye discomfort, and double vision. Differences in accommodation could result in changes in retinoscopic reflex, distant vision acuity, and pupil diameter [7]. In our case, the patient reported symptoms of blurred vision for distant objects in both eyes, difficulty reading from a distance, and frequent headaches possibly caused by ciliary spasms. The patient also frequently used a smartphone.

The assessment and diagnosis of accommodative spasms involve the presence of involuntary accommodation, which causes the eye's primary focus to be closer. Signs of accommodative spasm include a significantly negative power in manifest refraction and a positive power or less or zero less in cycloplegic refraction. Distinguishing between cycloplegic and manifest refraction relies on the patient's typical refractive condition and helps identify latent refractive errors, which are particularly noticeable in patients with emmetropia and hypermetropia [3,5,15].

Cycloplegic drugs such as homatropine hydrobromide, atropine sulfate, tropicamide, and cyclopentolate hydrochloride act as anticholinergic agents, blocking muscarinic receptors to inhibit the action of acetylcholine. It induces relaxation in accommodation by temporarily paralyzing the ciliary muscles. This action leads to stretching of the anterior zonules and consequent lens thinning, enabling the eye to focus on distant objects. Cycloplegics is the standard approach in various clinical situations, such as pediatric cases, pseudomyopia, intermittent or constant esotropia, latent hyperopia, and accommodation issues such as fatigue, insufficiency, or spasm [16–19]. Another indication is the combination of inconsistent refractive power and negative spherical aberrations. Additionally, ocular examinations that assess pupillary reflex, extraocular movement, and orthoptic evaluation aid in diagnosing accommodative excess or spasm [4,20]. In this study, we used cyclopentolate 2% to identify the presence of accommodative spasm.

The primary objective in managing pseudomyopia is to facilitate the patient's accommodation. However, prescribing the full minus lens power from the manifest refraction for extended periods is not recommended. Although this approach might improve distance VA, it will not effectively address the underlying accommodative response. Various strategies may be involved in treatments to alleviate accommodative dysfunction, including vision therapy; use of cycloplegic agents such as homatropine hydrobromide, atropine sulfate, tropicamide, and cyclopentolate hydrochloride to alleviate accommodative spasms; addition of nearpoint plus lenses; and guidance on visual hygiene practices [19,21,22].

The majority of reviewed literature leans toward less aggressive treatments, such as using cycloplegic agents, adding lenses for near work during cycloplegic treatment, manifest or cycloplegic refractions for distance, base-in prisms, and vision therapies designed to relax accommodation and enhance fusional vergence ranges [20]. If attempts to induce cycloplegic relaxation are unsuccessful, prescription eyeglasses might be considered, and in refractory cases, other methodologies, such as phakic or multifocal lens implantation, can be explored [14].

Using plus lenses alone might not eliminate pseudomyopia, but they can often prevent its recurrence by keeping the accommodative response in check. Pseudomyopia sometimes occurs because of high exophoria, where maintaining fusion through accommodative convergence is attempted. In these cases, vision therapy to enhance positive fusional

convergence can complement the core treatment for pseudomyopia. Educating patients about accommodation and pseudomyopia is crucial. Patients should understand that the treatment goal is to relax accommodation. Clinicians should explain that periods of blurred distance vision occur when accommodation is not relaxed and that this might persist until the accommodative response decreases [21].

Treatment for pseudomyopia typically yields positive outcomes, although it may progress slowly and require several weeks. Follow-up examinations should be frequent (e.g., every 1–4 weeks) until excess accommodation and symptoms diminish. Once accommodation has been effectively relaxed, annual examinations are sufficient to monitor progress [21].

In our patient, cycloplegic administration reduces ciliary spasms in the eyes since the first visit; therefore, negative spasms and positive spheres or pseudomyopia disappear and appear in both eyes of the patient, respectively. However, it seems not strong enough to relieve for a longer time the second visit still showed myopia in manifest refraction, although myopia was milder. After administering another drop of cycloplegic in the clinic on the second visit and prescribing plus lens correction on the third visit, the VA became 6/6. However, we still recommended continuing for 1 year using plus lens correction to keep the accommodation relaxed, especially while the patient is performing near work. A monthly routine check-up for the patient's refraction was also recommended.

CONCLUSION

Pseudomyopia clinical features in pediatric patients could vary and should be distinguished from those of accommodative spasms. Treatment approaches vary widely, reflecting the lack of consensus on management despite consistent assessment and diagnostic approaches.

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CONFLICT OF INTEREST

The author declares that there is no conflict of interest.

REFERENCES

1. Flitcroft DI, He M, Jonas JB, Jong M, Naidoo K, Ohno-Matsui K, et al. IMI – Defining and classifying myopia: A proposed set of standards for clinical and epidemiologic studies. Invest Ophthalmol Vis Sci 2019;60:M20–30. https://doi.org/10.1167/iovs.18-25957.
2. Padhy D, Rao A. Bimatoprost (0.03%)-induced accommodative spasm and pseudomyopia. BMJ Case Rep 2015;2015. https://doi.org/10.1136/bcr-2015-211820.
3. Kaštelan S, Gverović-Antunica A, Pelčić G, Gotovac M, Marković I, Kasun B. Refractive Changes Associated with Diabetes Mellitus. Semin Ophthalmol 2018;33:838–45. https://doi.org/10.1080/08820538.2018.1519582.
4. Riedl P, Škiljić D, Arnell P, Wannholt R, Zetterberg M, Andersson Grönlund M. Myopic shift and lens turbidity following hyperbaric oxygen therapy – a prospective, longitudinal, observational cohort study. Acta Ophthalmol 2019;97:596–602. https://doi.org/10.1111/aos.14010.
5. Díez Ajenjo MA, García Domene MC, Peris Martínez C. Refractive changes in nuclear, cortical and posterior subcapsular cataracts. Effect of the type and grade. J Optom 2015;8:86–92. https://doi.org/10.1016/j.optom.2014.07.006.
6. Prerana S, Revathy M. Persistent Accommodative Spasm. 2013.
7. Cho YK, Huang W, Nishimura E. Myopic refractive shift represents dense nuclear sclerosis and thin lens in lenticular myopia. Clin Exp Optom 2013;96:479–85. https://doi.org/10.1111/cxo.12064.
8. De Jong PTVM. Myopia: Its historical contexts. British Journal of Ophthalmology 2018;102:1021–7. https://doi.org/10.1136/bjophthalmol-2017-311625.
9. Wang N, Li S-M, Kang M-T, Jan C, Li S, Yusufu M, et al. Prevalence and risk factors of pseudomyopia in a Chinese children population: the Anyang Childhood Eye Study. British Journal of Ophthalmology 2020;105. https://doi.org/10.1136/bjophthalmol.
10. Hovland M. Pseudomyopia and nearwork-induced transient myopia (NITM) in young Norwegian adults. 2020.
11. Khalid K, Padda J, Pokhriyal S, Hitawala G, Khan MS, Upadhyay P, et al. Pseudomyopia and Its Association With Anxiety. Cureus 2021. https://doi.org/10.7759/cureus.17411.
12. Brodie SE, Ang M, Irsch K, Jackson M Lou, Mauger TF, Oostra T, et al. Clinical Optics and Vision Rehabilitation. 2022-2023 Basic and

Clinical Science Course, American Academy of Ophthalmology; 2023.
13. García-Montero M, Felipe-Márquez G, Arriola-Villalobos P, Garzón N. Pseudomyopia: A Review. Vision (Switzerland) 2022;6. https://doi.org/10.3390/vision6010017.
14. Manna P, Karmakar S, Bhardwaj GK, Mondal A. Accommodative spasm and its different treatment approaches: A systematic review. Eur J Ophthalmol 2023;33:1273–86. https://doi.org/10.1177/11206721221136438.
15. Bharadwaj SR, Roy S, Nandhini SP. Spasm of near reflex: Objective assessment of the near-Triad. Invest Ophthalmol Vis Sci 2020;61. https://doi.org/10.1167/IOVS.61.8.18.
16. Gomez-Salazar F, Campos-Romero A, Gomez-Campaña H, Cruz-Zamudio C, Chaidez-Felix M, Leon-Sicairos N, et al. Refractive errors among children, adolescents and adults attending eye clinics in Mexico. Int J Ophthalmol 2017;10:796–802. https://doi.org/10.18240/ijo.2017.05.23.
17. Wallace DK, Morse CL, Melia M, Sprunger DT, Repka MX, Lee KA, et al. Pediatric Eye Evaluations Preferred Practice Pattern®: I. Vision Screening in the Primary Care and Community Setting; II. Comprehensive Ophthalmic Examination. Ophthalmology 2018;125:P184–227. https://doi.org/10.1016/j.ophtha.2017.09.032.
18. Kaur K, Gurnani B. Cycloplegic and Noncycloplegic Refraction. StatPearls 2023. https://www.ncbi.nlm.nih.gov/books/NBK580522/ (accessed January 3, 2024).
19. Yasin N, Farooq S, Sharjeel M, Shahzad MA, Khalil I, Ahmed M, et al. Diagnosis and Treatment of Accommodative Spasm with Cycloplegics. Pakistan Journal of Medical and Health Sciences 2022;16:888–90. https://doi.org/10.53350/pjmhs22161888.
20. Park IK, Park YK, Shin JH, Chun YS. Pseudomyopia with paradoxical accommodation: a case report. BMC Ophthalmol 2021;21. https://doi.org/10.1186/s12886-021-01907-5.
21. Gifford KL, Richdale K, Kang P, Aller TA, Lam CS, Liu YM, et al. IMI – Clinical management guidelines report. Invest Ophthalmol Vis Sci 2019;60:M184–203. https://doi.org/10.1167/iovs.18-25977.
22. Jin H, Ou Z, Guo H, Zhao P. Myopic laser corneal refractive surgery reduces interdevice agreement in the measurement of anterior corneal curvature. Eye Contact Lens 2018;44. https://doi.org/10.1097/ICL.0000000000000364

Table 1. Examination Results

	UCVA		Objective Refraction		Subjective Refraction		BCVA		Postcycloplegic Objective Refraction		Postcycloplegic Subjective Refraction		BCVA	
	OD	**OS**	**OD**	**OS**	**OD**	**OS**	**OD**	**OS**	**OD**	**OS**	**OD**	**OS**	**OD**	**OS**
First Visit	6/27	6/24	S −3.75 C −0.50 × 51	S −7.25 C −1.00 × 159	S −4.50 C −150 × 90	S −5.00 C −1.00 × 125	6/12 Pinhole not improved	6/12 Pinhole 6/9	S +0.50 C −0.25 × 1	S +1.25 C −0.50 × 161	S +1.00	S +1.25	6/9	6/9
Second Visit	6/12	6/12	S −1.50 C −0.25 × 175	S −2.50 C −0.50 × 1.70	S +0.75	S +0.75 C −0.50 × 150	6/6	6/6						
Third Visit	6/6	6/6	S +0.25 C −0.25 × 17	S −0.50 C −0.25 × 132	S +0.50	S +0.25 C −0.50 × 150	6/6	6/6			S +1.25	S +1.00 C −0.50	6/6	6/6
Fourth Visit	6/6	6/6	C −0.50 × 8	C −0.25 × 172							S +0.50	S +0.25	6/6	6/6