CASE REPORT

Impact of Refractive Correction on Ocular Alignment in Accommodative Esotropia

Susweta Guha,[1] Bachelor of Optometry

Shoubhik Chakraborty,[2] M.Optom, B.Optom, FNN (Pediatric optometrist), FAAO

Sayar Chatterjee, Bachelor of Optometry

Biswajit Mondal, PhD, Master of Optometry, Bachelor of Optometry

[1]Bachelor of Optometry (3rd year), Department of Optometry, NSHM College of Management and Technology, Durgapur, India

[2]Department of Optometry, NSHM College of Management and Technology, Durgapur, India

ABSTRACT

Background

Accommodative esotropia is a type of esotropia in which the eye turns inward either constantly or intermittently, that is commonly seen in children. It is usually associated with uncorrected hypermetropia and an increased AC/A ratio. In this condition, the patient applies excessive accommodative effort to achieve clear vision, and this increased accommodation is accompanied by accommodative convergence, leading to inward eye deviation. The underlying cause is the abnormal relationship between accommodation and convergence initiated by excessive focusing effort due to uncorrected refractive error.

Case Report

A mother presented her five-year-old daughter who had been experiencing inward deviation of both eyes for six months. This deviation was especially apparent when performing near visual tasks. Clinical assessment revealed significant uncorrected hypermetropia. Accommodative esotropia resulted from the excessive accommodating effort generated by the uncorrected hypermetropia, which also increased accommodative convergence. Following a comprehensive ocular examination that included cycloplegic refraction, full hypermetropic spectacle correction was advised. At the follow-up, the patient's ocular alignment had improved and they had good compliance with their glasses. In the absence of glasses, the esodeviation continued, indicating how accommodation contributed to the deviation.

Conclusion

This case indicates that accurate cycloplegic refractive correction plays a critical role in the effective management of accommodative esotropia. Early detection of the condition and timely initiation of optical treatment, with spectacles, can help restore proper ocular alignment and support the normal development of binocular vision in children.

Correspondence regarding this article should be emailed to Shoubhik Chakraborty, M.Optom, B.Optom, FNN (Pediatric optometrist), FAAO, at **optomshoubhik@gmail.com**. *All statements are the authors' personal opinions and may not reflect the opinions of the Optometric Vision Development & Rehabilitation Association, Vision Development & Rehabilitation or any institution or organization to which the authors may be affiliated. Permission to use reprints of this article must be obtained from the editor. Copyright 2026 Optometric Vision Development & Rehabilitation Association. VDR is indexed in the Directory of Open Access Journals. Online access is available at* **ovdra.org.**
doi.org/10.31707/VDR2026.12.3.p240.

Guha S, Chakraborty S, Chatterjee S, Mondal B.Impact of refractive correction on ocular alignment in accommodative esotropia: A case report.. Vision Dev & Rehab 2026; 12(3): 240-6.

Keywords: accommodative esotropia; binocular vision; cycloplegic refraction; esodeviation; hypermetropia; pediatric strabismus

INTRODUCTION

Accommodative esotropia is one of the most common forms of convergent strabismus encountered during early childhood and is characterized by inward deviation of one or both eyes associated with accommodative effort.[1,2,3,4] The condition is commonly associated with uncorrected hypermetropia, in which excessive accommodation required to maintain clear

retinal image formation induces increased convergence due to the normal neurological relationship between accommodation and convergence mechanisms.[2,5,6] The accommodative convergence to accommodation (AC/A) ratio plays a significant role in the pathogenesis and clinical presentation of accommodative esotropia.[5,7]

The condition commonly develops between 2 and 6 years of age, although the onset may vary depending on the magnitude of hypermetropia and the visual demands of the child.[8,9] Clinically, the deviation is usually more noticeable during near fixation tasks such as reading or prolonged close work and may occasionally be present during distance fixation.[8-10] Parents commonly observe intermittent or constant inward turning of the eyes, which may gradually increase over time if left untreated.[8,10] Accommodative esotropia is broadly classified into fully accommodative esotropia, partially accommodative esotropia, and non-accommodative esotropia.[4,9,10] Understanding the underlying accommodative mechanism is essential for appropriate diagnosis and management.

Uncorrected hypermetropia is the main cause behind fully accommodative esotropia. In this case, excessive accommodative effort results in increased accommodative convergence which leads to ocular misalignment. In these cases, complete correction of the esodeviation occurs after proper hyperopic spectacle correction. Patients commonly present with inward deviation of the eyes particularly during near tasks, which often leads to asthenopia, headache, and difficulty in reading. Because of sensory adaptation mechanisms such as suppression, diplopia is uncommon in children.[5,11] Hypermetropia, normal extraocular muscle motility, and, in some cases, amblyopia have been reported in accommodative esotropia as key clinical findings.[8,11]

The diagnosis of accommodative esotropia is primarily established through comprehensive ophthalmic evaluation, including visual acuity assessment, cycloplegic refraction, ocular motility examination, and cover test evaluation.[3,12] The determination of the nature of the ocular deviation can be done through refractive correction which is essential for confirming the accommodative component of the esotropia.[3] Management mainly involves prescription of full cycloplegic hypermetropic correction to reduce accommodative demand and thereby decrease the associated convergence response.[5,13] In patients with a high AC/A ratio, bifocal lenses may be considered to control residual near deviation.[9] Timely management and early diagnosis are essential to prevent amblyopia and to promote proper binocular visual development and stable ocular alignment.[11,13]

CASE REPORT

A 5-year-old female child presented with her mother, with chief complaint of inward deviation of both eyes, more noticeable during near visual activities, for the past 6 months. There was no history of ocular trauma or previous ophthalmic consultation. There was no history of developmental milestone abnormalities. According to the parent, the deviation became more evident during reading and close fixation tasks.

On visual assessment at the initial visit, unaided distance visual acuity was recorded as 20/200 in the right eye and 20/200 in the left eye, while near visual acuity was N6 at 40 cm in both eyes. Dry/manifest retinoscopy revealed +5.00 DS hypermetropia in both eyes, with distance visual acuity improving to 20/100 OD and 20/100 OS. Atropine cycloplegic refraction revealed +7.00 DS in both eyes. With full +7.00 DS correction, visual acuity improved further to 20/80 OD and 20/80 OS. During the initial assessment, the esodeviation reduced with full hypermetropic correction; however, complete resolution of the deviation was confirmed after a one-week trial of full-time spectacle wear. Full cycloplegic correction was therefore prescribed. Along with full correction, Hart chart exercises were advised twice daily for 2 months as supportive therapy to improve accommodative flexibility and visual performance.[5,12,13]

Extraocular motility assessment performed at the initial evaluation revealed full, free, and painless ocular movements in all directions of gaze. Hirschberg corneal reflex testing suggested

esodeviation, which was subsequently quantified using prism bar cover testing. Orthoptic assessment using the cover-uncover test revealed a small manifest esodeviation, predominantly involving the right eye (see Figure 1). Such moderate angle esodeviation is frequently reported in accommodative esotropia associated with high hypermetropia.[5,8] Prism bar cover testing revealed approximately 30 prism diopters of esodeviation. Important sensory tests such as stereopsis and the Worth four-dot test (WFDT) were attempted, but the child was unable to respond reliably.



Figure 1. Eso-deviation of right eye on First visit

Anterior segment examination by using slit lamp biomicroscopy showed normal eyelids and adnexal structures within the normal limit. The conjunctiva was clear with no evidence of congestion or discharge. The cornea was transparent in both eyes, with no signs of ulceration or opacity. The anterior chamber was of normal depth and quiet. The pupillary reactions of both eyes are regular and reactive. The crystalline lens was transparent bilaterally. Posterior segment evaluation using the ophthalmoscope revealed healthy optic discs with distinct margins, and the cup-to-disc ratio in both eyes was 0.4. Retinal vasculature, macula, and peripheral retina appeared within normal limits in both eyes.

Based on the clinical findings, we diagnosed a case of fully accommodative esotropia with bilateral high hypermetropia. This was confirmed through complete resolution of the esodeviation after a one-week trial of full-time spectacle wear with full cycloplegic correction of +7.00 DS OU. The patient was advised to continue full-time spectacle wear. The importance of compliance was explained to the parent to ensure proper visual development and maintenance of ocular alignment.[5,14,15]

At the 2-month follow-up visit, the patient's mother reported good compliance with regular spectacle wear. At follow-up visit, best-corrected distance visual acuity was 20/30 OD and 20/30 OS, and near visual acuity was N5 at 40 cm in both eyes. At the 2-month follow-up, orthophoria was observed with spectacle correction at both distance and near, while examination without glasses showed approximately 20 prism diopters of esotropia at both distance and near. Extraocular movements remained full, free, and painless in all directions of gaze. Cycloplegic refraction was repeated, and the result was the same +7.00 DS as the initial refraction. We recommended wearing the same prescription glasses and returning for a follow-up after 2 months. At that time, the patient's ocular findings were stable and showed no discernible alterations in alignment (Figure 2). Written informed consent was obtained from the patient's parent for documentation of clinical details and photographs.

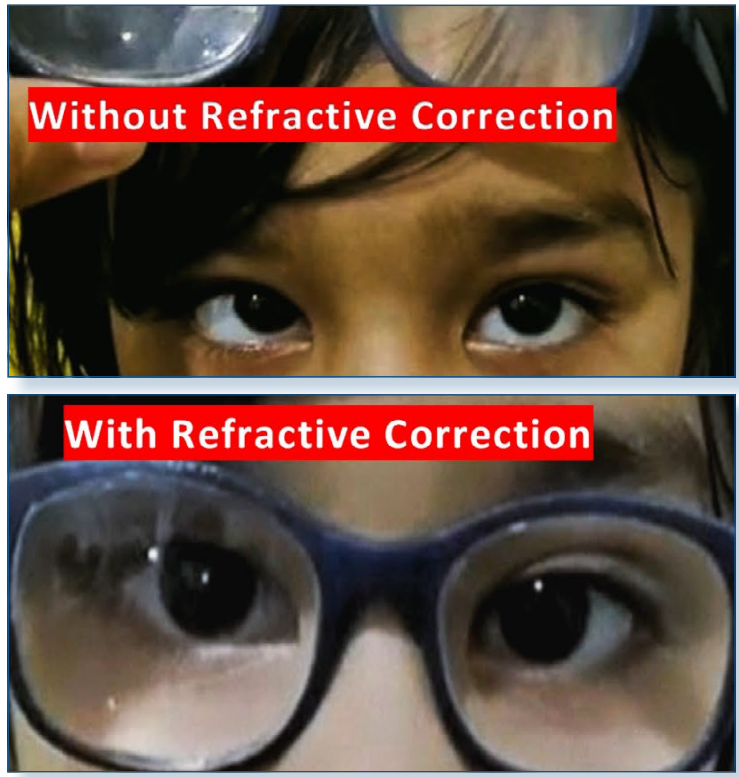


Figure 2. Demonstrations of reduced esodeviation with refractive correction.

DISCUSSION

This case highlights the importance of comprehensive refractive assessment in children presenting

with esotropia and high hypermetropia. Although dry/manifest retinoscopy revealed +5.00 DS OU, atropine cycloplegic refraction demonstrated a higher latent hypermetropic component of +7.00 DS OU, indicating that accommodation may have masked the full refractive error during the initial assessment. Therefore, cycloplegic refraction helped determine the maximum hypermetropic correction required for optical management. With full spectacle correction, the esodeviation improved to orthophoria, supporting the diagnosis of refractive accommodative esotropia. Early detection and timely initiation of appropriate optical correction can assist in restoring ocular alignment and may support binocular visual development in children.[1,5,7] Under normal physiological conditions, accommodation required for near fixation is accompanied by a proportional amount of convergence through the accommodative convergence mechanism. However, in children with significant hypermetropia, excessive accommodation is required even for clear distance vision, leading to increased accommodative convergence and consequent inward deviation of the eyes.[1,5,7]

The patient demonstrated orthophoria with spectacle correction while esotropia persisted in the absence of glasses, confirming the diagnosis of fully accommodative esotropia. Similar findings have been reported in several clinical studies evaluating the role of optical correction in accommodative esotropia management.[5,13,16]

Accommodative esotropia commonly presents between 2 and 6 years of age and is often initially noticed by parents as intermittent or constant inward deviation of one or both eyes.[8,9,10,17] The deviation is usually more pronounced during near fixation tasks such as reading or focusing on small objects. Extraocular movements are generally full and unrestricted, with no associated neurological or paralytic pathology.[9,10] Based on the clinical response to refractive correction, accommodative esotropia is broadly classified into fully accommodative, partially accommodative, and non-accommodative types.[4,9,10]

Uncorrected hypermetropia is the main cause of fully accommodative esotropia, a kind of esodeviation in which an aberrant relationship between accommodation and convergence causes the eyes to deviate inward. Usually, full hypermetropic spectacle correction fully corrects this abnormality. Patients with this condition usually become orthophoric while wearing glasses and exhibit normal ocular alignment.[2,5] In contrast, another type partially accommodative esotropia shows only partial improvement even after appropriate spectacle correction. The deviation is not fully resolved, indicating the involvement of additional non-accommodative factors.[4,10,17] Therefore, unlike fully accommodative esotropia, this condition often requires a different management approach, such as orthoptic therapy or surgical intervention.[10,17,18]

The present case demonstrates several classical features of accommodative esotropia. The patient, a 5-year-old child, falls within the commonly reported age group for onset of the condition. The history of inward deviation becoming more noticeable during near activities strongly supports the role of excessive accommodative demand in the development of the esodeviation. Additionally, cycloplegic refraction revealed high bilateral hypermetropia (+7.00 DS), which is a major contributing factor in the pathogenesis of accommodative esotropia.[8,10,17]

Another important clinical feature in this case was the presence of full, smooth, and painless extraocular movements in all directions of gaze. This observation effectively ruled out paralytic or restrictive causes of strabismus and indicated that the deviation was concomitant in nature. Furthermore, the anterior and posterior segment evaluations were found to be within normal limits, suggesting that the esotropia was purely refractive and functional, with no underlying structural abnormality of the eye.[9,10] Birch et al. reported that prompt optical correction can significantly improve binocular sensory outcomes and stereopsis development in children with accommodative esotropia.[11]

The detection of high bilateral hypermetropia during cycloplegic refraction was an important clinical finding in this case.[7,16,18] This patient's

assessed refractive error was noticeably high, which increased the case's clinical significance.

Although accommodative esotropia is usually associated with a moderate degree of hypermetropia, the extremely high hypermetropic correction in this case requires significant accommodating effort for clear vision.[16,18] This leads to a significant increase in accommodative convergence, which increases the likelihood of a more pronounced inward deviation of the eyes, especially if therapy is postponed or neglected.

The significance of doing accurate and comprehensive cycloplegic refraction in paediatric patients is highlighted by this example. In addition to preventing under-correction, accurate refractive error estimate guarantees the proper prescription of glasses.[3,12,15] Maintaining appropriate ocular alignment and successfully managing accommodative esotropia depend heavily on prompt and accurate optical correction.

An additional significant aspect of this case was the clear and complete response to optical correction. The patient demonstrated orthophoria with full hypermetropic correction, while the esodeviation persisted in the absence of spectacles.[5,14] This finding confirmed the diagnosis of fully accommodative esotropia. Good compliance with spectacle wear, as reported by the parent, also contributed substantially to the favourable treatment outcome.[5,13,14,16] In many pediatric cases, poor compliance with spectacles may compromise alignment and binocular visual development. The recommended Hart chart exercise was used as supportive therapy to improve accommodative flexibility and visual performance along with refractive correction (Figure 3).[5,12,13]

The deviation measured approximately 30 prism diopters, indicating a moderate angle of esotropia, which is commonly observed in accommodative cases but remains clinically significant enough to warrant early intervention.[8,11,19] Delay in diagnosis and management may predispose the child to amblyopia, suppression, and loss of binocular vision.[8,11,19] In the present case, early diagnosis and prompt prescription of full cycloplegic correction resulted in stable ocular alignment and prevention

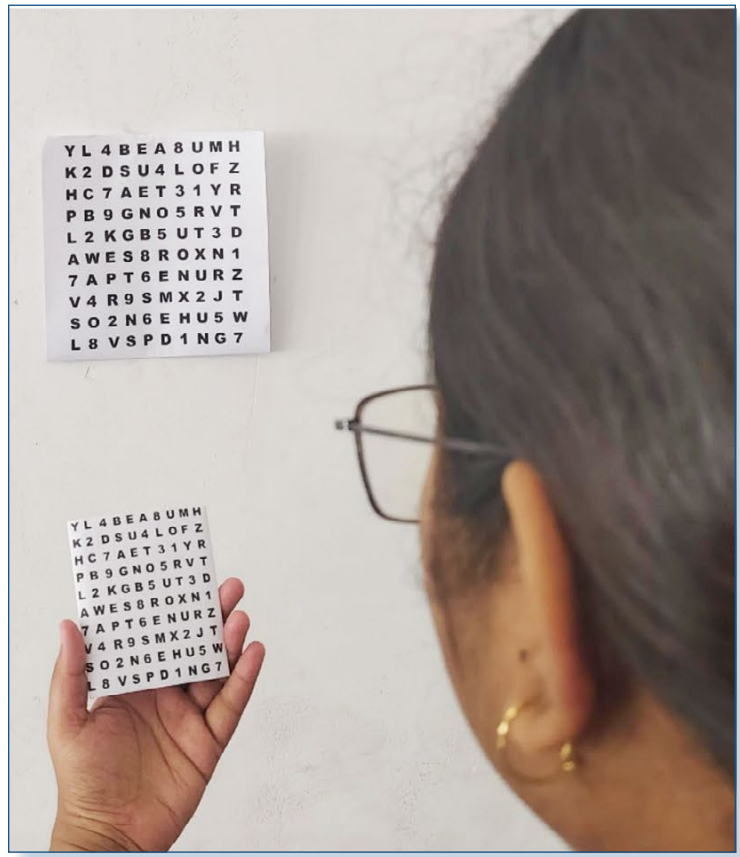


Figure 3. Hart Chart Exercise

of potential sensory complications. Comparison of findings before and after refractive correction is demonstrated by Table 1.

The present case also emphasizes the importance of pediatric binocular vision assessment and vision therapy support in improving visual function.[20,21] Recent studies by Chakraborty et al. demonstrated the effectiveness of active vision therapy and binocular rehabilitation in pediatric visual disorders, particularly amblyopia and binocular vision dysfunction.[20,21] Additionally, consistent spectacle wear was associated with stable ocular alignment during followup. Longterm compliance with prescribed hyperopic correction has been identified as one of the most important prognostic factors in maintaining ocular alignment in accommodative esotropia.[5,13,16]

As seen in comparing Figures 1 and 2, it is common for the esotropic angle without glasses to increase relative to the angle prior to wearing glasses. This most plausible explanation with high bilateral hyperopia is that prior to spectacle wear, the child does not accommodate fully to attain

Table 1: Comparison of Findings Before and After Refractive Correction

Parameter	Initial Visit / Pre-Correction	After Full spectacle Correction / Follow-up
Unaided Distance VA	20/200 OU	20/200 OU
Best-Corrected Distance VA with +7.00 DS	20/80 OU	20/30 OU at 2-month follow-up
Near Vision	N6 at 40 cm OU	N5 at 40 cm OU
Cycloplegic Refraction	+7.00 DS OU	Stable at +7.00 DS OU
Ocular Alignment without Glasses	Approximately 30 PD esotropia	Approximately 20 PD esotropia at 2-month follow-up
Ocular Alignment with +7.00 DS Glasses	Esodeviation reduced initially; complete resolution confirmed after 1-week spectacle trial	Orthophoria at distance and near
Extraocular Movements	Full, free, and painless	Full, free, and painless
Final Diagnosis	Fully accommodative esotropia with bilateral high hypermetropia	Stable fully accommodative esotropia with good spectacle compliance

Abbreviations: OU – Both eyes; DS – Diopter sphere; PD – Prism diopters.

sharp visual acuity. That under-accommodation and de-focus may be purposeful in tolerating some level of blur in exchange for the avoidance of diplopia. Once the child has worn the spectacles that helps improve visual acuity, the accommodative reflex operates more fully when the glasses are removed and the AC/A response increases the esotropic angle. Parents should be advised to expect to see the child's eye turn increase without the glasses relative to the angle before receiving the Rx. They should be reassured that this is normal, and that what is more important is alignment and binocular vision with the glasses on.

This case is an example of accommodative esotropia. It highlights that proper refraction especially cycloplegic refraction is extremely important. Furthermore, appropriate management and consistent use of prescribed spectacles are essential. From this case, it can be understood that full hypermetropic correction is the most effective treatment for accommodative esotropia. Our patient in this case report exhibited residual mild bilateral refractive amblyopia after a two-month period of wearing her full cycloplegic prescription. Bilateral visual acuity tends to continuously improve over the course of the first year with full-time wear of the prescription in high bilateral hyperopia in young patients, as demonstrated by one of the PEDIG studies.[22] We added Hart Chart accommodative therapy, as in our clinical experience, this may accelerate the process.

CONCLUSION

This case demonstrates a typical presentation of fully accommodative esotropia in a 5-year-old girl with bilateral high hypermetropia. Comprehensive ocular examination, particularly cycloplegic refraction, helped identify the full hypermetropic correction required for optical management. With consistent full-time spectacle wear, the esodeviation resolved and orthophoria was maintained. This case supports the role of early diagnosis, accurate refractive correction, compliance with spectacle wear, and regular follow-up in the management of accommodative esotropia and prevention of binocular vision complications in children.

REFERENCES

1. Khurana AK. Theory and practice of orthoptics and binocular vision. 4th ed. New Delhi: Elsevier; 2020.
2. Khurana AK. Parsons' diseases of the eye. 22nd ed. New Delhi: Elsevier; 2015.
3. Rutstein RP. Update on accommodative esotropia. Optometry. 2008;79(8):422-431.
4. Von Noorden GK, Campos EC. Binocular vision and ocular motility. 6th ed. St Louis: Mosby; 2002.
5. Sreelatha OK, Al Marshoudi HA, Mameesh M, Al Zuhaibi S, Ganesh A. Accommodative esotropia: An outcome analysis from a tertiary center in Oman. Oman J Ophthalmol. 2022;15(3):274-278.

6. Parks MM. Abnormal accommodative convergence in esotropia. Am J Ophthalmol. 1960;49(6):1205-1210.
7. Weakley DR Jr. The association between accommodative esotropia, hyperopia, and the AC/A ratio. Trans Am Ophthalmol Soc. 1999;97:987-1021.
8. Taylor D, Hoyt CS. Pediatric ophthalmology and strabismus. 4th ed. Philadelphia: Elsevier; 2013.
9. American Academy of Ophthalmology. Pediatric ophthalmology and strabismus. San Francisco: American Academy of Ophthalmology; 2022.
10. Wright KW, Spiegel PH, Thompson LS. Handbook of pediatric strabismus and amblyopia. New York: Springer; 2006.
11. Birch EE. Binocular vision and stereopsis in children with accommodative esotropia. Vision Res. 2013;90:1-6.
12. American Optometric Association. Care of the patient with strabismus: Esotropia and exotropia. St Louis: American Optometric Association Clinical Practice Guideline; 2011.
13. Alrasheed SH, Challa NK, Aljohani S, Almutairi NM, Alnawmasi MM. Effectiveness of treatment modalities for childhood esotropia: A systematic review. PeerJ. 2025;13:e19584.
14. Mohan K, Sharma A. Long-term treatment results of accommodative esotropia. J AAPOS. 2014;18(3):261-265. **https://doi.org/f57c23**.
15. Cotter SA. Management of childhood hyperopia: A clinical perspective. Optom Vis Sci. 2007;84(2):103-109.
16. Raab EL. Follow-up monitoring of accommodative esotropia. J AAPOS. 2001;5(4):246-249.
17. Weakley DR Jr, Birch EE. The role of anisometropia in the development of accommodative esotropia. J AAPOS. 2001; 5(3):153-157.
18. Mohney BG. Common forms of childhood esotropia. Ophthalmology. 2001;108(4):805-809.
19. Helveston EM. Accommodative esotropia. In: Surgical management of strabismus. 5th ed. Belgium: Wayenborgh Publishing; 2005. p. 141-152.
20. Chakraborty S, Parida S, Hossain S, Ray S, Hajira R. The impact of active vision therapy on vision and binocularity for anisometropic amblyopia cases. EC Ophthalmology. 2024;15(9):1-8.
21. Chakraborty S, Sarbajna P, Vinekar A, Shetty B. Outcomes of vision therapy among children with cerebral visual impairment: A retrospective study. Optom Vis Perform. 2024;12(1):35-42.
22. Wallace DK, Chandler DL, Beck RW, Arnold RW, Bacal DA, Birch EE, Felius J, Frazier M, Holmes JM, Hoover D, Klimek DA, Lorenzana I, Quinn GE, Repka MX, Suh DW, Tamkins S; Pediatric Eye Disease Investigator Group. Treatment of bilateral refractive amblyopia in children three to less than 10 years of age. Am J Ophthalmol 2007 Oct;144(4):487-96. **https://doi.org/cvwmxm**.



AUTHOR BIOGRAPHY:
Susweta Guha
Course: Bachelor of Optometry and Vision Science, 4th Year
NSHM Knowledge Campus, Durgapur
University: Maulana Abul Kalam Azad University of Technology (MAKAUT), West Bengal
Current Position: Clinical Intern, L V Prasad Eye Institute (LVPEI), Bhubaneswar