Clinical Scenario of Pseudomyopia Before and After Vision Therapy: Two Case Reports

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ABSTRACT

Introduction: Cycloplegic agents are the most common method used for accommodation relaxation in accommodative spasm cases. However, concerns have arisen about the possibility of rebound effects following the cessation of cycloplegic treatment. This case reports demonstrates a clinical approach for managing accommodative spasm, utilizing the modified Borish's delayed subjective technique and vision therapy. Additionally, also evaluates the patient's clinical status after six months of cessation of therapy.

Case Report 1: A 9-year-old female presented with a headache and blurred vision. Her presenting visual acuity was 1/60 in each eye and variable myopia reached up to -6.00 diopters spherical. Cycloplegic refraction showed a low hyperopia and improvement in visual acuity to 6/9 in each eye. This confirmed the diagnosis as accommodative spasm and was referred to a vision therapy clinic for further management.

Case Report 2: A 13-year-old female presented with 6/36 visual acuity in both eyes and variable myopic refractive error but cycloplegic refraction revealed low hyperopia and improvement in visual acuity. Then, she was referred to optometry and vision therapy clinic.

Conclusion: A modified Borish's delay subjective technique can be applied to instantaneous relief of accommodative spasm. Vision therapy can be useful in restoring normal accommodative and vergence functions. Sustained improvement in visual function and stability of accommodation is obtained after six months of cessation of vision therapy.

Key words: Accommodative spasm; high myopia; pseudomyopia; vision therapy.

Financial Interest : Nil
Conflict of Interest : Nil

Received : 10.10.2023
Accepted : 10.12.2023

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Access this article online
Website: www.nepjol.info/index.php/NEPJOPH
DOI: https://doi.org/10.3126/nepjoph.v16i1.59178

ISSN: 2072-6805, **E-ISSN:** 2091-0320

INTRODUCTION

Accommodation system of human eye is a highly complicated function, which is required to perform very fine and detailed work without exerting too much strain on the eyes (Krishnacharya, 2014). The well-known near reflex is automatically activated when an object is brought close. This reflex involves the ciliary muscle in an involuntary reflex action that includes accommodation, pupil constriction, and convergence. The near reflex spasm is rare and is characterized by a triad of pseudomyopia, miosis, and esodeviation. However, this triad may not be present all the time. When accommodation is compromised, the patient is unable to relax the accommodation, resulting in blurred vision at both far and near distances. Such condition is known as accommodative spasm (Goldstein & Schneekloth, 1996).

Accommodative spasm is also known as pseudmyopia, hyperaccommodation, or ciliary spasm (Griffin, 1982; Rutstein et al, 1988; Wajuihian & Hansraj, 2015). The effects of Accommodative spasm leads to the development of myopia in emmetropes, increase myopia in already myopes, and a decrease in hypermetropia in hyperopes (Rutstein & Daum, 1998). Accommodative spasm is not very common and often diagnosed in children, teens, and young adults (Daum, 1983). Less than 3% of people with accommodative disorders have accommodative spasm. Although a number of organic causes have been reported, the etiology of accommodative spasm is most often functional or idiopathic (Rutstein et al, 1988).

There is no standardized approach pattern for managing accommodative spasm. The most commonly used treatment approaches are the use of weaker cycloplegics, plus lenses, and Vision therapy (Rutstein et al, 1988; Hussaindeen et al, 2014). According to a recent study by Satgunam (2018), Modified Borish's delayed subjective technique also helps to relieve accommodative spasm.

Here, we describe the case of two patients with accommodative spasms who were treated with modified Borish's delay subjective technique and vision therapy and who displayed normal clinical findings and orthoptic parameters with no signs of rebound effect after six months of cessation of treatment.

CASE REPORT 1

A 9-year-old female (August 2021) presented to the pediatric ophthalmology department of Tilganga Institute of Ophthalmology with complaints of a gradual progressive blurring of vision for distance and near along with headache and difficulty in doing near activities for six months. Her mother gave a history of using digital devices during the COVID-19 lockdown period primarily for academic purposes. The mother denied any history of head trauma, physical or psychological illness, or medication use. Her presenting visual acuity was 1/60 for distance and less than N36 at 40 cm in each eye. Pupillary reactions were normal to light with full ocular movement. An orthoptics assessment could not be performed due to poor vision and poor fixation. Her dry retinoscopy was up to -6.00 Diopter Spherical (DS) in both eyes. Her cycloplegic retinoscopy (with 1% Cyclopentolate eye drops instilled half an hour before examination) was +0.50 DS in each eye. Under cycloplegia, her unaided visual acuity

improved to 6/9 in each eye. Anterior segment and dilated ophthalmoscopy were normal. Based on these clinical findings, the case was diagnosed as accommodative spasm by the pediatric ophthalmologist and referred to the optometry and vision therapy clinic for further management.

After One week, the patient followed up in the vision therapy clinic. Upon examination, her visual acuity was 2/60(less than N36 at 40 cm) in the right eye and 3/60(less than N36 at 40 cm) in the left eye. Binocular visual acuity was recorded 3/60. Dynamic retinoscopy (Monocular Estimation Method, MEM) was unstable and a lead of accommodation of -3.00DS was measured in each eye. An orthoptics assessment could not be performed due to poor vision and poor fixation. Then, as described by Satgunam (2018), modified Borish's delayed subjective technique was performed.

In the distance phase, +2.75 DS lens (the sum of cyclo-refraction value and normal Negative Relative Accommodation (NRA) value of about +2.50DS) was placed in the trail frame of both the eyes, and the patient was asked to read the magazine of comfortable letters size (N18) at a comfortable distance of 10cm for 30 minutes binocularly. After the letters were easily readable by the patient, successive smaller letters of size N8 and N6 were presented and was asked to read them at a distance between 20 to 25 cm until the letters became clear. The patient was able to read a letter-size N6 at a distance of 35 to 40 cm after 30 minutes of reading. The patient was binocularly defogged in 0.25 steps looking at the distance visual acuity chart while being encouraged to keep reading down the chart. With this procedure, under plano viewing conditions, the patient read 6/9 monocularly and binocularly.

In the near phase, the goal of the near phase was to stabilize accommodation. The Negative Relative Accommodation (NRA) and Positive Relative Accommodation (PRA) procedure was performed binocularly to measure the range of accommodation, by having the patient to view a near target (N8) at 40 cm when maintaining the vergence posture as a constant. The NRA was determined first and then the PRA. Vergence-driven accommodation via the Convergence Accommodation/Convergence (CA/C) cross-link is eliminated when this procedure carried out monocularly. Following this near procedure, the patient could read N6 binocularly at 40 cm and 6/9 in each eye at a distance.

After the completion of the near and distance phase, the patient became comfortable with her vision. Her detailed orthoptics evaluation was carried out. In dynamic retinoscopy, the reflex was crisp and showed a lag of +0.50 DS in each eye. Dynamic retinoscopy was performed using the Monocular Estimated Method (MEM) with Welch-Allyn retinoscope. The prism bar cover test showed esophoria of 2 prism dioptres for near and orthophoria for distance. The patient had poor negative fusional vergence for near measured as 4/2(break/recovery). However, positive fusional vergence was normal. Her stereopsis was about 80sec of arc measured with Titmus-fly stereotest. The Near point of convergence (NPC) was measured as 6cm and the Near point of Accommodation (NPA) was 7.10 cm monocularly and 7.25 cm binocularly. NPC and NPA were measured using a Royal Air Force (RAF) ruler. Step vergence (positive and negative) was measured using prism bar.

She was advised for office-based vision therapy with synaptophore, plus lens rack and accommodative flipper of +-2.00DS (monocularly and binocularly) for 15 min each. Plus lens rack and accommodative flipper were used to train their ability to relax and improve the facility of her accommodation respectively. For increasing the amplitude of the negative fusional vergence, we started with the peripheral slides, and with the increase in the amplitude, we went towards macular and foveal slides to increase the difficulty of the task. After 2 weeks of office-based vision therapy, her unaided visual acuity was measured 6/5(N6 at 40cm) monocularly and binocularly. An orthoptics examination was also performed and seemed to be in a normal state. Thus, the patient was instructed to undergo home-based vision therapy (brock string and accommodative flipper of +-2.00 DS) and was asked to follow up after one month.

At the follow-up visit (October 2022), she had no visual complaints. She read 6/5(N6 at 40cm) from each eye. She was advised to discontinue therapy as her orthoptic status appeared to be normal. At the last follow-up (April 2022), undertaken six months after discontinuation of treatment, the patient was asymptomatic and maintained clear vision. All the orthoptic parameters were in the normal range and no clinical signs of rebound effects, so the patient asked for a regular annual follow-up.

CASE REPORT 2

A 13-year-old girl (March 2022) was examined in the pediatric ophthalmology department of Tilganga Institute of Ophthalmology with complaints of intermittent double vision, severe headache interfering with her near activities, and blurred vision. There was a past history of using glasses of -2.00 DS in both eyes which were prescribed by another practitioner. The patient was not taking any medication and denied having suffered any head trauma. Presenting visual acuity was 6/36, N36 at 40 cm in each eye. Upon a non-cycloplegic retinoscopy a variable reflex up to -4.50 DS in both eyes was demonstrated. With 1% cyclopentolate eye drop, her refraction was +1.00 DS in the right eye and +1.25 DS in the left eye which improved visual acuities to 6/6 in right eye and 6/9 in the left eye. All ocular health examination was normal. The patient was diagnosed with an accommodative spasm and referred to our vision therapy clinic.

In the vision therapy clinic a week later, the patient had binocular visual acuity of 6/36 partial in the distance with the patient complaining of ocular pain and double vision. Monocular visual acuity was recorded 6/36 (N10 at 15 cm) in each eye without complaining of doubling of letters. Orthophoria was present at a distance, and 6 prism diopters esophoria at near. Stereopsis was recorded 400 sec of arc at near with stereo fly test. Dynamic retinoscopy showed a -1.00 DS lead in the right eye and -1.25 DS in the left eye. The positive fusional vergence was normal for distance and near whereas the negative fusion vergence was recorded as 4/2 (break/recovery) for distance and 2/0 (break/recovery) for near. The detailed orthoptic evaluation was not performed due to poor visual acuity.

The patient was asked to read a magazine book for 30 minutes while wearing +3.50 DS lenses binocularly. After the completion of the near and distance phase as described in case 1, her visual acuity measured 6/6 (with +0.50 DS) at a distance and N6 at 40 cm in each eye. The

dynamic retinoscopy was repeated and recorded as +0.75 DS in each eye. In the Prism bar cover test, esophoria of 4 prism dioptres for near and orthophoria for distance was measured. The negative fusion vergence was improved and recorded as 8/6 (break/recovery) for distance and 6/2 (break/recovery) for near. The correction of +0.50 DS was prescribed in both eyes. The child was not able to come for office-based vision therapy, so we advised her to do home-based vision therapy with brock string and +-2.00D accommodative flippers under monocular and binocular viewing conditions.

After a month of follow-up (May 2022), the patient was comfortable with his vision. Her visual acuity was 6/6 (N6 at 40 cm) with the correction of +0.50DS in each eye. Dynamic retinoscopy measured as +0.75 DS in the right eye and +1.00 DS in the left eye. The cover test revealed orthophoria and 2 prism dioptres base-in for distance (6 m) and near (40 cm) respectively. Stereopsis, as measured with the Titmus fly test was 50 sec of arc. The negative fusional vergence was measured as 12/8(break/recovery) for distance and 16/12(break/recovery) for near. She was advised to discontinue the therapy and follow up after six months.

At the six-month follow-up (December 2022), the patient was asymptomatic. Her presenting visual acuity was 6/6 (N6 at 40 cm) in each eye. Her measured orthoptic values fell within Schiemen's normative range. She was asked her for annual follow-up examination at a nearby eye center.

DISCUSSION

To the best of the author's knowledge, this is the first report on accommodative spasms to evaluate clinical scenarios before and after modifying Boorish's subjective technique and vision therapy and after six-month discontinuation from vision therapy.

In our case, both patients reported having a mild hyperopic refractive error. Mild myopia, mild hyperopia, or emetropia is common in accommodative spasms (Rutstein & Daum, 1998). Although a number of functional causes of psychogenic origin have been reported (Savin, 1959; Schor et al, 1986; Goldstein & Schneekloth, 1996; Rutstein & Daum, 1998), the etiology of the accommodative spasm in these patients is unclear. In the first case, there was a history of, increased screen time primarily resulting from the COVID-19 lockdown period. An MRI test was also conducted, which ruled out any neurological cause. In the second case, there was no history of emotional stress or change in lifestyle or anything contributory to a functional origin for the accommodative spasm. According to the father, the child used to perform near work in low light and had limited outdoor activity. The patient's accommodative spasm may have been triggered by prolonged screen time and/or near work, limited outdoor activities, and inefficient negative fusional vergence. Based on the patient's reported symptoms of intermittent double vision in the second case, it is highly likely that their accommodation spasm is impacting the vergence system through the AC/A link.

The management of accommodative spasm lacks a standardized approach pattern. Currently, the most commonly utilized method is the use of cycloplegic agents. However, there have been cases within the literature where the use of cycloplegic agents does not relieve the accommodative spasm after the cycloplegic

effect weans away. Amongst the 17 cases reported in a series, only 4 of them exhibited complete resolution of their accommodative spasm (Rutstein, 1988).

In this report, both patients had instantaneous relief of accommodative spasms using the modified Borish's delay subjective technique. Both patients showed a more stable retinoscopic reflex after this technique. The exact mechanism by which this modified fogging technique works is unclear. Upon conducting an orthoptic evaluation after modifying Borish's delay subjective technique, it was observed that both patients exhibited poor accommodative facility and negative fusional vergence, and esodeviation at near. So vergence therapy and accommodation relaxation therapy can be useful, after resolving the accommodative spasm.

While this technique may appear time-consuming, it is non-invasive and does not carry the side effects associated with the use of cycloplegic agents. Additional clinical studies and case series are needed to establish the efficacy of the combination of modified Borish's delay subjective technique and vision therapy.

CONCLUSION

A thorough orthoptic evaluation is recommended for all cases of accommodative spasm. Atropine, a strong cycloplegic, is commonly used for both diagnosis and management to relax the spasm. However, the modified Borish's delay subjective technique presented here provides an effective alternative with no pharmacological side effects and instant relief of accommodative spasms. After the instantaneous relief of accommodative spasms, vision therapy can be useful in restoring normal accommodative and vergence functions.

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