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Journal of Clinical and Experimental Ophthalmology

Mini Review

Treatment Approaches of Accommodative Spasm: A Mini-Review

Prithwis Manna[1*] , Puja Sarbajna[1], Sourav Karmakar[2]

[1]Department of Optometry, Narayana Nethralaya Eye Hospital, Bangalore, Karnataka, India; [2]Department of Optometry and Vision Science, Amity University, Gurgaon, Haryana, India

ABSTRACT

Accommodation is a process that allows a sharp focus on the fovea by relaxing the ciliary muscle, decreasing the lens's diameter, and increasing its thickness and curvature. The midbrain supranuclear impulse produces the motor command, leaves the Edinger Westphal nucleus and creates the near-triad synkinesis. An accommodative spasm occurs when the near triad reflexes fail. Common causes of accommodative spasms include excessive near work, psychological stress, head trauma, and strabismic and non-strabismic conditions. This review conducted a comprehensive analysis to comprehend the clinical characteristics, aetiology, diagnostic markers, and treatment alternatives. The most common symptoms of accommodative spasm include reduced distance and near vision, frontal headache, sensitivity to light or glare, and eyestrain during close work. In addition, the signs of accommodative spasm are a variation in visual acuity at a distance, a decreased retinoscopic reflex, and a smaller pupil. Despite its many limitations, cycloplegia is the primary method for accurately identifying the accommodative spasm. It includes increased intraocular pressure, blockage of the lacrimal duct, macular oedema, an allergic reaction, discomfort, and blurs vision. This mini-review focuses on non-invasive treatment alternatives, such as regular cycloplegic drugs, bifocals for near work, manifest prescription, the modified optical fogging approach, and vision therapy. The objective is to relax the accommodation and eradicate the symptoms associated with pseudomyopia.

Keywords: Accommodative spasm; Pseudomyopia; Cycloplegic agents; Vision; Refraction; Modified optical fogging

INTRODUCTION

Accommodation is a process to enable a sharp focus on the fovea with the relaxation of the ciliary muscle, reducing the diameter of the lens and increasing its thickness and curvature [1]. The midbrain supranuclear impulse produces the motor command as it moves to the Edinger-Westphal nucleus [2]. The oculomotor nerve III transmits the motor command, making the accommodation, convergence, and pupil constriction synkinesis [3,4].

Therefore, accommodative spasm is the condition that results in blurry and distorted images when one of the parts malfunctions. Pseudomyopia and a spasm of the near reflex are other titles for the term accommodative spasm [5].

There are two types of pseudomyopia. First, caused by the constant accommodative tension in young hyperopes during near work increases the tone of the ciliary muscles. The pathological severity and duration cause the other. Myopia disappears when cycloplegic drops relax the accommodation of one dioptre of normal ciliary tone [6]. By contrast, the spasm of the near reflex is an advanced form of accommodative spasm characterised by intermittent accommodation, convergence, miosis, unilateral and bilateral abduction limitations, and high manifest myopia [7]. Variations in visual acuity, inconsistent retinoscopy findings for distance, and a lack of accommodation in near retinoscopy are all symptoms of accommodation spasm [8].

This mini-review alternates between the terms accommodative spasm, pseudomyopia, and spasm of the near reflex. The review discusses the successful management options for the accommodative spasm condition of recent research [9].

Correspondence to: Prithwis Manna, Department of Optometry, Narayana Nethralaya Eye Hospital, Bangalore, Karnataka, India, Tel: +91-8762652480; E-mail: prithwis-manna@hotmail.com

Received: 28-Dec-2022, Manuscript No. JCEO-23-21001; **Editor assigned:** 30-Dec-2022, PreQC No. JCEO-23-21001 (PQ); **Reviewed:** 13-Jan-2023, QC No. JCEO-23-21001; **Revised:** 20-Jan-2023, Manuscript No. JCEO-23-21001 (R); **Published:** 30-Jan-2023, DOI: 10.35248/2155-9570.23.14.936.

Citation: Manna P, Sarbajna P, Karmakar S (2023) Treatment Approaches of Accommodative Spasm: A Mini-Review. J Clin Exp Ophthalmol. 14:936.

LITERATURE REVIEW

The article "Accommodative Spasm and Its Different Treatment Approaches: A Systematic Review" follows the PRISMA guideline and searches for all relevant English-language articles, including the keywords accommodative spasm, spasm of near reflex, pseudomyopia, optical fogging, and cycloplegic refraction published until June 2022. Researchers discussed the clinical characteristics, aetiology, diagnostic indicators, and treatments available for accommodative spasm.

Pathophysiology

An accommodative spasm is rare in which the accommodation reaction exceeds the stimulus [10]. The affected patient cannot adjust the power of the crystalline lens to adjust the focus distance. As a result, myopes are more sensitive to close work-related side effects than hypermetropia patients [11]. A small number of findings report accommodative spasms after long work hours [12]. Initial refraction revealed myopia, but cycloplegia caused a change to hypermetropia [13]. After refractive surgery, latent hyperopia often exhibits a misleading myopic correction due to over-accommodation [14]. Unnecessary parasympathetic eye stimulation results in accommodative spasms, which leads to a ciliary muscle spasms and pseudomyopia [15].

Accommodative spasms may or may not accompany miosis and convergence [16]. Large-scale exophoria and occasional exotropia can lead to accommodative spasms [17]. Accommodative spasms are associated with the sudden onset of esotropia in adults and children [18,19]. In the end, accommodative spasm is associated with nystagmus marked by rapid, conjugate, horizontal, vertical, pendular, and circular eye movements [20].

A clinical spectrum reflects the condition of spasm of the near reflex. Headaches, intermittent double vision, a significant myopic shift during periods of convergence, and miosis are typical symptoms.

Multiple case reports describe the relationship between accommodative spasm and emotional or physiological stress, ocular trauma, and brain injuries. In addition, other studies have found a link between accommodative spasms and the neurological conditions such as labyrinth dysfunction, toxic encephalopathy, head trauma, and cerebellar tumours [21].

Clinical features

The most prevalent manifestations of accommodative spasm are impaired distance and near vision, frontal headaches, and sensitivity to light or glare, eyestrain during close work, eye discomfort, and double vision [22]. Variations in accommodation have been responsible for variations in distance vision acuity, retinoscopic reflex, and pupil size [23]. Exotropia, exophoria, and sudden esotropia frequently result in the blurred distance and near vision in both eyes. Pseudomyopia occurs when a cycloplegic refractive error is less than the manifest refraction. Static refraction cannot attenuate the excess negative power required to relax the accommodation at a distance. Therefore, cycloplegic refraction or a modified fogging procedure is required.

Evaluation and diagnosis

Accommodative spasm is an involuntary state of accommodation that brings the primary focal point of the eye closer. Accurate manifest refraction based on retinoscopy suggests estimating the lowest negative lens power that results in the highest visual acuity. Experimental indicators of accommodative spasm include a high minus power in manifest refraction and a plus power or zero or less in cycloplegic refraction. Cycloplegic refraction is achieved by using 1% atropine eye drops twice daily for three days before the refraction or by applying 1% cyclopentolate and 1% tropicamide eye drops twice at a five-minute interval [24]. The difference between manifest and cycloplegic refraction depends on the normal refractive state. It is a component of latent refractive error. The differences between patients with emmetropia and hypermetropia are marked [25].

Additional methods exist for identifying the accommodation spasm. For instance, low amplitude of accommodation relative to the patient's age and accommodation lead. In another case, researchers compared the modified optical fogging technique with cycloplegic refraction to break the accommodative spasm [26]. The technique was efficient when the accommodative spasm occurred following post-cycloplegic refraction. The method requires the patient to perform a near task while stabilising the patient's visual acuity and retinoscopy reflex. Satgunam et al. [8] diagnosed two patients with accommodative spasms following cycloplegic refraction and immediately alleviated the spasm using the modified optical fogging method. The modified optical fogging technique produced a refraction difference of one diopter [27].

Inconsistent refractive power in combination with negative spherical aberrations is another indicator [28]. Shetty et al. [14] identified the effect of internal defocus on aberrometry and concluded that aberrometry played a role in confirming the case of accommodative spasm.

Additional ocular examinations include a constricted pupillary reflex and extraocular movement to detect episodes of esotropia and exotropia. A thorough evaluation of orthoptics simplifies the accommodative excess or spasm diagnosis in all instances [29]. A low plus in the monocular estimation method, adequate performance with minus lenses, and inferior performance with plus lenses signify over-accommodation, which can lead to accommodative spasm and pseudomyopia, as recommended by Mitchell Scheiman.

Management

When the aetiology of a subject is unknown, it is necessary to seek treatments in lower-level branches. Each disorder requires the most efficient treatment method. Initially, an attempt is made to relax the accommodations and eliminating all pseudomyopia-related symptoms. If cycloplegic relaxation techniques are ineffective, prescription eyeglasses can be

prescribed, and if that fails, other techniques should be considered.

Regarding the poor performance of the cycloplegic modification, McMurray et al. [30] first described the removal of the crystalline lens and implantation of the phakic lenses to alleviate accommodation spasm [30]. Later, Gedar and Aykan implanted multifocal lenses to attempt a similar procedure [31].

However, mostly less invasive treatments such as cycloplegic agents [32,33], bifocals for near work, manifest refraction prescription, cycloplegic refraction for distance, modified optical fogging prescription for distance, base-in prisms, and vision therapy are recommended to alleviate accommodation and improve fusional vergence.

DISCUSSION

This review has explored the pathophysiology, features, assessment, and treatment of an accommodative spasm. Cycloplegic refraction and the modified optical fogging method play a crucial role in diagnosing the accommodative spasm. There needs to be a specific protocol for managing the accommodative spasm. Eye drops containing cycloplegic agents, such as 1% atropine, 1% cyclopentolate, and 2% or 5% homatropine are the most frequently reviewed treatment method. A study by Bohlmann et al. [34] was the first to discuss the use of cycloplegic drugs to treat accommodative spasm and is still in use today [34]. It has been demonstrated repeatedly that cycloplegic eye drops to improve the diagnosis and treatment of accommodative spasm.

Manifest refraction can also treat this disorder by reducing distance blur. Chan et al. [29] prescribed eyeglasses to their patients based on their apparent refractive error. It was noted, however, that this treatment was not as effective as cycloplegia. Because of the blurred near vision caused by cycloplegic drops, the authors recommended wearing bifocals daily to restore near vision. A study by Rutstein et al. [12] for near vision suggests plus lenses.

Daily use of cycloplegic drops may have harmful ocular and systemic effects. It includes elevated intraocular pressure, the pigment of the cornea and conjunctiva, the anterior chamber, lacrimal duct obstruction, macular oedema, damage to the corneal endothelium layer, hyperaemia, an allergic reaction, discomfort, and decreased vision [35]. Systemically, it causes tachycardia, hypertension, headache, trembling, excessive perspiration, irregular heartbeat, pounding, confusion, hallucinations, drowsiness, impaired coordination, flushed skin, high fever, slurred speech, xerostomia, seizures, disorientation, anxiety, and death [36].

The modified optical fogging method was used in three studies to treat accommodative spasm. The technique can provide instantaneous and dependable results. For example, 66% of patients with mild spasm of the near reflex were treated with optical fogging in a cohort study. Utilising a lens power greater than the projected average Negative Relative Accommodation (NRA) value of +2.50 dioptres for thirty minutes causes optical fogging. The author then instructed the patient to read the letters from a distance on the visual acuity chart and to defog the plus power in increments of 0.25 dioptres binocularly.

Few researchers demonstrate that accommodative training was convenient for pseudomyopia. However, Shanker et al. [4], Prerana et al. [22], and Hussaindeen et al. [19] recommended conducting a comprehensive orthoptics evaluation and using the Hart Chart and an accommodative flipper to treat the anomaly. Satgunam et al. [8] referred to the accommodative exercise as home-based vision therapy after performing the modified optical fogging technique.

CONCLUSION

Owing to excessive near work, blur and fluctuating vision, eye deviation, and headaches are the most common symptoms of accommodative spasm. Furthermore, pseudomyopia, exotropia, and miosis are symptoms of an overactive accommodative system, which causes an accommodative spasm.

Though the diagnostic gold standard for identifying accommodative spasm is cycloplegic drops. The authors created the modified optical fogging technique as an alternative to cycloplegic drops. The strategy produces immediate results that end the spasm. As there is a correlation between accommodation and convergence, a thorough orthoptic evaluation is necessary to rule out organic processes requiring vision therapy to normalise accommodation and convergence functions.

This mini-review explores different treatment options. It suggests using cycloplegia to diagnose accommodative spasm, then combining a modified optical fogging method with vision therapy to normalise accommodation and vergence.

CONFLICT OF INTEREST

The author(s) declared no potential conflicts of interest to this article's research, authorship, and/or publication.

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