MATHEWS Open Access Journals

ISSN: 2474-6932

Case Reports | Mathews Journal of Ophthalmology

A Case of Hyperopia Combined with Accommodative Insufficiency in a Young Adult

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Received Date: 02 Mar 2017

Accepted Date: 22 Mar 2017

Published Date: 23 Mar 2017

Citation: Bempong BB and Baafi EB. (2017). A Case of Hyperopia Combined with Accommodative Insufficiency in a Young Adult. M J Opht. 2(2): 015.

ABSTRACT

This case study demonstrates how the correction of ametropia influences the binocular vision and accommodation systems of an individual. In this case, a patient reported to the Optometry clinic with complains of asthenopic symptoms and intermittent diplopia. Careful history taking, ocular examinations and binocular vision assessment revealed accommodative insufficiency and refractive error. The ocular examinations performed included; Visual Acuity, Slit lamp bimicroscopy and funduscopy. The Binocular vision assessment included; Refraction, Extra Ocular Motility tests, Phoria measurement at far and near, Near Point of convergence, Negative Fusional Vergence (NFV), Positive Fusional Vergence (PFV), Negative Relative Accommodation (NRA), Positive Relative accommodation (PRA), amplitude of accommodation (AA), Binocular accommodative facility (BAF), and Accommodative Convergence/ Accommodation Ratio (AC/A Ratio). Based on the findings of the above tests, the appropriate treatment plan was given, and this consisted of vision therapy and spectacle dispensing.

INTRODUCTION

Hyperopia is a type of refractive error in which light rays converge to a focus behind the retina when accommodation is relaxed. The distance visual acuity of an uncorrected hyperope can be greatly improved by accommodation. The degree to which a hyperope's distance visual acuity can be improved by accommodation is limited only by the amplitude of accommodation. Hyperopia is corrected by converging or positive lenses. The correcting lens must be of such a power that the secondary focal point of the lens coincides with the far point of the eye [1].

On the other hand, accommodative insufficiency occurs when the amplitude of accommodation is lower than that expected for the patient's age and is not due to sclerosis of the crystalline lens [2]. Patients with accommodative insufficiency are usually unable to focus or sustain focus for near work (for example reading). Patients often complain of difficulty in reading, irritability, poor concentration, blurred vision and/or headaches. These symptoms start almost simultaneously with an increase in near work demand.

Several examination findings can help in diagnosing Accommodative Insufficiency. According to Scheiman and Wick, these examination findings can be grouped into two categories: direct and indirect measures of accommodative stimulation. The direct measures include reduced amplitude of accommodation, difficulty clearing -2.00 lens with monocular accommodative facility, high monocular estimation method finding, and high fused crossed-cylinder finding. Indirect measures of accommodative stimulation include reduced positive relative accommodation, difficulty clearing -2.00 lens with binocular accommodative facility, and low base-out to blur finding at near [3].

According to Wick and Sheiman, the recommended sequential management of accommodative insufficiency begins with the correction of ametropia, added near lenses and then optometric vision therapy. Uncorrected refractive error can lead to accommodative fatigue, which can be easily alleviated in many patients. Retesting the binocular and accommodative status should also be considered after fully correcting the ametropia [3].

MATERIALS AND METHODS

History of Patient

On September 5, 2016, a twenty-nine year old male postgraduate student visited the Optometry Clinic at the Kwame Nkrumah University of Science and Technology, and complained

of reading difficulties, blur vision and headaches. He couldn't recall exactly when these symptoms started but emphasized that they have become worse over the past few weeks. On direct questioning, he reported that there is occasional double vision when reading. He had no remarkable ocular history and had never attended the eye clinic before. His medical history revealed nothing remarkable. When asked whether he has ever been diagnosed of any of the following conditions: Hypertension, Diabetes Mellitus, Asthma and Ulcer; he responded negative to all of them. The drug history revealed that, he had instilled methylcellulose eye drops on both eyes but the condition remained unchanged. He had no remarkable family ocular & family medical histories.

Ocular Examination

Visual Acuity

The distance visual acuity (DVA) was measured using a standard Snellen chart at 20 feet and the near visual acuity (NVA) was measured using the N-System card.

DVA: Right Eye (RE): 20/30 Left Eye (LE): 20/30

NVA: RE: N6 LE: N6 Both Eyes (BE): N5 (with difficulty)

Slit Lamp Examination and funduscopy

These were done to examine the anterior and Posterior segments of the eye.

RE	STRUCTURE	LE
No dandruffs, clean with lashes well aligned	**EYELIDS/EYE LASHES**	No dandruffs, clean with lashes well aligned.
Clear, no injection, no growth, slight pigmentation.	**CONJUNCTIVA**	Clear, no injection, no growth, slight pigmentation.
Clear, no stains with fluorescein	**CORNEA**	Clear, no stains with fluorescein
Deep and quiet	**ANTERIOR CHAMBER**	Deep and quiet
Brown, flat and uniformly pigmented	**IRIS**	Brown, flat and uniformly pigmented
Round, Equal, Reactive to light, No RAPD	**PUPIL**	Round, Equal, Reactive to light, No RAPD
Clear, no opacity	**LENS**	Clear, no opacity
Clear, no cells	**VITREOUS**	Clear, no cells

FUNDUSCOPY

RE	STRUCTURE	LE
Distinct margins, no parapapillary atrophy, ISNT rule obeyed, no haemorrhages, Cup to Disc ratio was 0.2, normal disc size	**Optic Disc**	Distinct margins, no parapapillary atrophy, ISNT rule obeyed, no haemorrhages, Cup to Disc ratio was 0.2, normal disc size
No drusens, no oedema, foveal reflex present	**Macula**	No drusens, no oedema, foveal reflex present
No haemorrhages, No abnormality detected.	**Peripheral Retina**	No haemorrhages, No abnormality detected.

Binocular Vision Assessment

This included Refraction, Interpupillary distance (IPD) measurement, Extra Ocular Motility tests, Phoria measurement at far and near, Near Point of convergence (NPC), Negative Fusional Vergence (NFV), Positive Fusional Vergence (PFV), Negative Relative Accommodation (NRA), Positive Relative accommodation (PRA), Amplitude of accommodation (AA), Binocular accommodative facility (BAF), and Accommodative Convergence/ Accommodation Ratio (AC/A Ratio).

The patient's findings are shown below

Extra Ocular Motility (EOM) Tests

The movements of both eyes were accurate, smooth, full and extensive in all directions of gaze. There was no complaint of pains or double vision on moving the eyes.

Objective Refraction (Retinoscopy)	RE: + 07.5/ -0.25× 180
	LE: +0.75/ -0.25× 180
Subjective Refraction	RE: +0.75DS 20/20
	LE: +0.75DS 20/20
	IPD= 71/67mm
NPC	26cm
AA (Push-up to blur)	3D
Distance Phoria	Orthophoria
Near Phoria	3X'
AC/A (Calculated)	4.8:1
Base-Out Near	17/22/10
Base-In Near	13/21/13
Vergence facility	12(cycles per minute) cpm
NRA	2.5
PRA	-1.25
BAF	5cpm (difficulty clearing –ve lenses)

Impression

Hyperopia

Accommdative Insufficiency

Plan

Patient educated on his condition and the treatment options available.

Vision therapy was prescribed (Pencil push-ups: Three separate 20-minute sessions in a day for 2weeks).

2nd Visit – 19/09/2016

On this day, the patient claimed of slight reduction in the symptoms reported during the first visit.

On direct questioning, he revealed that he could not cope

with the vision therapy because of his academic works. He said he could not make enough time for the vision exercises.

Ocular Examination

Slit lamp examination and funduscopy showed nothing remarkable. The binocular vision assessment was repeated and the findings were as below:

Objective Refraction (Retinoscopy)	RE: + 0.75/ -0.25× 180
	LE: +0.75/ -0.25× 180
Subjective Refraction	RE: +0.75DS 20/20
	LE: +0.75DS 20/20
	PD= 71/67mm
NPC	25cm
AA (Push-up to blur)	3D
Distance Phoria	Orthophoria
Near Phoria	3X'
AC/A (Calculated)	4.8:1
Base-Out Near	17/21/10
Base-In Near	13/21/13
Vergence facility	12cpm
NRA	2.5
PRA	-1.25
BAF	6cpm (difficulty clearing –ve lenses)

The Binocular Vision Assessment was then repeated with the patient wearing his distance prescription (+0.5) and a +1D lens for near work. The exam results are as below:

NPC	12cm
AA (Push-up to blur)	8.00D
Distance Phoria	2X
Near Phoria	7X'
AC/A (Calculated)	4.8:1
Base-Out Near	17/21/10
Base-In Near	13/21/13
Vergence facility	12cpm
NRA	+2.50D
PRA	-2.00D
BAF	12cpm

IMPRESSION (IMP)

Hyperopia and Accommodative Insufficiency

Rx

RE: +0.75DS 20/20

LE: +0.75DS 20/20

ADD: +1.00DS N5

The spectacle of the above description was dispensed in a bifocal.

Review was scheduled for the following month.

3rd Visit: 19th October, 2016.

The patient stated the condition had greatly improved. He could read for a longtime without any difficulty.

Ocular Examination

Slit lamp and funduscopy revealed nothing remarkable.

Imp

No abnormality Detected.

DISCUSSION

On the first visit, refraction and Binocular vision assessment were done. Subjective refraction of both eyes showed a hyperopia of 0.75D for each. The results showed that, the Amplitude of Accommodation (AA) was below the expected value for his age. The minimum AA for his age group is 7.75D while his AA was 3D. His near point of convergence (NPC) was receded. In addition to this, the positive relative accommodation (PRA) was also less than the expected value. His PRA was -1.25D while the expected value is -2.50D. Aside this, the Binocular Accommodative Facility (BAF) was below the expected value of 12 cycles per minute (cpm). The patient's BAF was 5cpm with difficulty clearing the minus (-ve) lenses.

All the other findings were within the normal range. These findings put together suggest strongly that the patient's problem is from an accommodative dysfunction rather than a binocular vision anomaly. Amplitude of accommodation of 2D less than the minimum value for that age, failing of the monocular and binocular accommodative facility coupled with difficulty clearing minus lenses of ±2D flipper lenses, and positive relative accommodation ≤ 1.25 is diagnostic of accommodative insufficiency.

According to the American Optometric Guidelines, the basis for treatment of accommodation and vergence dysfunction is to assist the patient to function efficiently in school performance, at work, and/ or in athletic activities. Another aim is to relieve ocular, physical, and psychological symptoms associated with these disorders.

Vision therapy was prescribed for this patient with the hope of increasing his amplitude of accommodation. He was not compliant enough and as a result plus lens of 1D was prescribed for near work in addition to the distance correction. The positive lenses reduced the accommodative demand and as such, he was now relieved of the unbearable ocular symptoms reported earlier.

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