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# A possible case of heavy eye phenomenon

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## Abstract

***Aim:*** **To describe a case of possible heavy eye phenomenon and discuss the differential diagnosis.**
***Method:*** **Details are reported of a boy who presented at age 16 years, having previously attended the orthoptic department as a young child. Documentation of the case is presented including the findings in childhood, findings at later presentation and photographic illustrations.**
***Results:*** **The orthoptic findings for this boy when discharged at age 9 years differed from the findings at age 16 years. At age 9 the patient showed good corrected visual acuity in each eye, good binocular functions and normal stereo-acuity. At age 16, the patient had a variable right hypotropia, refractive error of right $-8.50/-1.25 \times 5$, left $+0.25/-0.50 \times 177.5$ and axial lengths of right 26.22 mm and left 22.86 mm.**
***Conclusions:*** **This is most likely a case of heavy eye phenomenon. Previous records are useful in determining the onset of the condition.**

**Key words:** Heavy eye phenomenon, High myopia, Hypotropia

## Introduction

The heavy eye phenomenon is characterised by a moderate to marked amount of axial anisomyopia, which is associated with a hypophoria on the side of the more myopic eye. A head tilt to the side of the more myopic eye may also be present. The head posture is thought to assist in the maintenance of comfortable binocular single vision, although some patients who show an abnormal head posture do not demonstrate any binocular single vision.

The phenomenon was first described in 1960 in the French literature[1] and was later described by Bagshaw[2] who presented a large cohort of 250 patients with vertical deviations and anisometropia. The patients in this cohort had both hypermetropia and myopia. Many also had other contributing factors, such as penetrating injury, endocrine dysfunction and retinal detachment.

The heavy eye phenomenon is not a frequently reported condition. However, reports are relatively consistent and all emphasise that although the condition is called the heavy eye phenomenon it is not considered to be affected or worsened by gravity.[3–6] Authors report that the more myopic eye is the hypotropic eye,[1,2,3,6] but some associate the condition with esotropia[3] whilst others associate it with exotropia.[4]

This report details a case of possible heavy eye phenomenon. The features of the case are discussed in relation to the literature on heavy eye phenomenon and differentiated from a possible IVth nerve palsy.

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## Case report

A 16-year-old boy presented to the orthoptic department complaining of blurred vision in the right eye, which had been present for some time. He also complained of some problems focusing and said that his right eye appeared to intermittently 'drop down'. He experienced very intermittent vertical diplopia, which was not troublesome, and he was not concerned by the cosmetic appearance of the intermittent vertical deviation.

The boy had first been seen in the orthoptic department aged 4 years following a school screening test. At that time there was no deviation on cover test and acuity was right 6/5 and left 6/9. He was refracted and ordered glasses, right eye plano, left eye $-0.50/+1.25 \times 55$. Occlusion was commenced and the vision of the left eye improved to 6/5. The boy was discharged when aged 9 years with corrected acuity of 6/5 either eye, no deviation and good stereopsis. At discharge the refractive correction was right eye $-2.50/-1.00 \times 180$, left eye plano/$+1.25 \times 55$.

At age 16 years the uncorrected visual acuity was right 1/60, improving to 6/36 with a pinhole, and left 6/4. Glasses wear had been discontinued some years previously through personal choice. The patient did not recall any problems with optical distortion whilst using glasses and he felt that he managed visually very well using his left eye.

Cover test revealed a minimal right hypotropia with very poor right fixation. The deviation became a marked right hypotropia on distance fixation with prolonged dissociation (Fig. 1). There was no evidence of an abnormal head posture. Ocular movements showed a minimal underaction of the right eye in dextro-elevation. The angle of deviation using prism reflections was initially $4^{\Delta}$ right hypotropia but increased to approximately $25^{\Delta}$ at 6 m with prolonged dissociation. It was not possible to plot a Hess chart due to the poor right visual acuity.

Ophthalmic examination revealed a refractive error of right $-8.50/-1.25 \times 5$, left $+0.25/-0.50 \times 177.5$. Axial lengths were right 26.22 mm and left 22.86 mm. Fundus

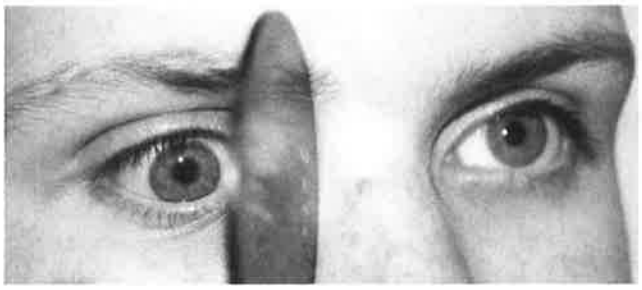

**Fig. 1.** The patient aged 16 years showing a moderate amount of right hypotropia. The deviation was most evident at distance fixation after prolonged dissociation.

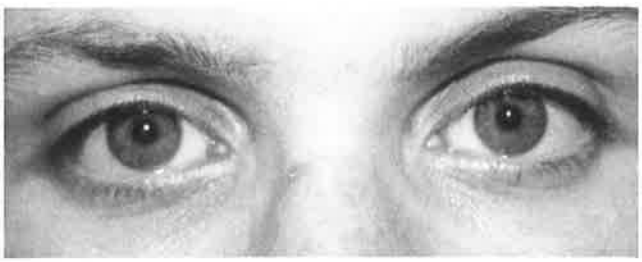

**Fig. 2.** The cosmetic appearance of the deviation was excellent and did not require surgical intervention.

and media findings were normal. The acuity of the right eye improved to 6/24 + 1 with the required lenses in a trial frame. With and without the optical correction sensory fusion was demonstrable using Bagolini glasses for near but there was no evidence of motor fusion or stereopsis.

As the maximum angle of vertical deviation was only present after prolonged dissociation, the cosmetic appearance of the squint was generally excellent (Fig. 2) and the patient did not want to consider surgical correction.

## Comment

From the previous orthoptic records it was evident that when discharged at age 9 years this patient had no manifest deviation, good and equal corrected acuity, no vertical muscle imbalance and good stereopsis. Since discharge the right eye had become increasingly myopic and a vertical deviation had developed.

It is possible that this is a case of left IVth nerve palsy with an inhibitional palsy of the right superior rectus with fixation by the left eye due to the poor right vision. However, there was no history of trauma, no indication of left IVth nerve underaction on ocular motility and the deviation did not vary appreciably in the different positions of gaze. A left IVth nerve palsy therefore seems unlikely. A more likely diagnosis is the heavy eye phenomenon.

When the boy was discharged at age 9 years there was a slight degree of anisomyopia, with the right eye requiring $-2.50/-1.00 \times 180$ to achieve 6/5 acuity. Since discharge the myopia had progressed to $-8.50/-1.25 \times 5$ and there was a 3.36 mm difference in the axial length of the two eyes.

Previously reported cases of the heavy eye phenomenon have had myopia ranging in severity from −3.00 to −29.00 DS[3,4,6] and axial lengths have varied from 27.6 mm to 33.32 mm.[4] Whilst the myopia and axial length in this case are not as high as the previously reported cases, the patient is only 16 years old and it is possible that the myopia and the axial length may increase further with time.

It is evident that the corrected visual acuity of the right eye had deteriorated since discharge, as only 6/24 + 1 could be achieved with optical correction. There was no ocular pathology. As a right acuity of 6/5 had been recorded at age 9 years, after the age of visual maturity, it seems unlikely that the eye had become amblyopic. It is possible that with prolonged wear of the appropriate optical correction the right vision might return to the previous 'best' level.

The vertical deviation was variable, being greatest on prolonged dissociation for distance fixation. This may have been due to the very reduced right acuity and weak binocularity. Mechanisms of muscle compression or muscle stretching have been proposed to account for the eye position in heavy eye phenomenon.[3,4,5] Bagolini *et al.*[5] proposed that the progressive myopia and therefore the increasing axial length of the globe produced a progressive compression of the enlarged globe against the lateral wall of the orbit. In addition the displaced lateral rectus muscle was also displaced vertically which resulted in the vertical or heavy eye component of the strabismus.

Kowal *et al.*[3] described a patient with the heavy eye phenomenon who showed an esotropia and hypotropia. They commented that the condition was exacerbated by the presence of very high unilateral high myopia (−29.00 DS) which caused a compression of the lateral rectus muscle against the lateral orbital wall that was evident on magnetic resonance imaging.

Taylor *et al.*[4] described a cohort of 9 patients who demonstrated hypotropia of the more myopic eye and exotropia. They suggested the exotropia might be due to a lack of fusion resulting from the presence of poor vision in the more myopic eye. They proposed the hypotropia might be due to changes in the centre of gravity in the orbit caused by the expansion of the orbital contents forward as a result of the increased axial length.

## Conclusion

Given the orthoptic and ophthalmic findings at age 9 years, the current age of the patient and the likelihood of further increase in myopic anisometropia and axial length, the heavy eye phenomenon appears to be the most likely diagnosis for this case.

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