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Dense amblyopia: should we consider encouraging long-term continued refractive correction of the amblyopic eye? A case of getting the balance right

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Abstract

***Aims*: To promote consideration of whether patients should be encouraged to continue wearing a refractive correction in cases where the vision in the amblyopic eye remains very poor. To highlight the benefits of full refractive correction in cases of a densely amblyopic eye when there is no improvement in the visual acuity.**
***Method*: A case is described where a young adult presented in clinic with a secondary strabismus with eccentric fixation, a grossly amblyopic eye due to stimulus deprivation, nystagmus and diplopia.**
***Results*: Once the full refractive correction was prescribed, the cosmesis improved and the diplopia was eliminated. However, there was no improvement in the visual acuity of the amblyopic eye.**
***Conclusion:* All patients should be refracted in house and the full prescription ordered. The patient should then be re-assessed by an orthoptist to decide on the best management options.**

Key words: Amblyopia, Balance lens, Diplopia, Refractive correction, Strabismus

Introduction

This article is based on the following case study of a teenager who had been prescribed glasses with a balance lens for the amblyopic eye. A balance lens is defined as a spectacle lens of undesignated power serving only to balance the weight and the appearance of its mate in front of the other eye.[1] The details of the findings and subsequent management are described.

Case report

An 18-year-old male presented in clinic for the third time, having first been seen at the age of 10 months and then again aged 15 years. At the time of his third referral he complained of vertical and horizontal diplopia. He had been prescribed spectacles Right +2.25/+1.75 @20 and had a left balance lens of +3.00 dioptres.

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Previous history

As a child, aged 10 months, the patient presented with a constant manifest strabismus. An EUA showed a presumed congenital star-shaped central posterior nuclear opacity in the left eye which was not operated on. There was no refractive error at this time. Occlusion was attempted but abandoned aged 3 years. Cosmetic squint surgery was performed aged 4 years with recession of the left inferior oblique and left medial rectus, and resection of the left lateral rectus. The patient was discharged age 7 years.

When aged 15 years, he had a consultation enquiring about the benefit of left cataract removal. His vision with glasses was recorded as RE 6/9; LE Counting fingers. Surgery was not recommended due to possible raised intraocular pressure in the left eye and he was discharged.

Age 18 years

When I first saw the patient, at age 18 years, he was complaining of recent-onset horizontal and vertical diplopia. Glasses had been prescribed at age 12 years and were worn for close work and watching TV. Vision was recorded as RE 6/9 : LE ½–1/60 (balance lens). Cover test, with and without glasses, showed a manifest left convergent squint, left hypertropia and eccentric fixation (Fig. 1). The deviation became divergent on dissociation and there was variable manifest nystagmus in the left eye only. Ocular movements (Fig. 2) showed slight limitation of the left eye on adduction without diplopia (divergent on dextro-version). There was a moderate underaction of the left eye on laevo-elevation, contrary to the deviation in the primary position. Diplopia was worst on left gaze due to increased convergence. It was not possible to measure the deviation as the angle varied from convergent to divergent. However, there was no diplopia with a 12 dioptre prism base-out, even on laevo-version.

Management options

Possible solutions to the patient's problems were:

- prismatic spectacles;
- botulinum toxin to the left medial rectus;
- occlusive contact lens;
- Bangerter foils, occlusion on glasses/face;
- intraocular occlusive lens;

Fig. 1. Deviation in the primary position without glasses. Monocular viewing shows cataract and eccentric fixation in the left eye.

Fig. 2. *Upper row:* Ocular movements, without any glasses, in the primary position and on versions. The deviation is more convergent on laevo-version and divergent on dextro-version. *Lower row:* The outcome with the contact lenses. Note the spontaneous improvement in movement on laevo-version.

- re-refract and order full-strength glasses;
- strabismus surgery.

The glasses that he was wearing were:

Right +2.25 Dsph./+1.75cyl @19°. Left +3.00 Dsph. balance lens.

The patient was re-refracted in clinic, and his full prescription was tested as:

Right +2.25Dsph/+1.75cyl @ 20°. Left +6.50 Dsph.

There was no improvement in the level of vision in the left eye with the full correction but the full prescription was ordered and the patient was re-tested 3 weeks later. On review, the patient's diplopia had resolved due to correction of the convergent angle, which was now more stable, and his cosmesis was good when wearing his new glasses.

However, the patient was still very against wearing glasses as he felt they were unattractive and he would never wear them when out socially. He was keen to try contact lenses as an alternative and these produced an even better outcome than the glasses, as shown in Fig. 2.

Area of suppression

Fields showing the area of suppression were plotted with and without refractive correction; note the difference on laevo-version. Fig. 3 (left) shows the area of suppression without glasses, which was approximately 20° horizontally. Compare this with Fig. 3 (centre) that shows the increase in field of suppression to 65° horizontally with the full corrective glasses prescription. Fig. 3 (right) shows the scotoma has increased to approximately 100° horizontally when the patient is wearing contact lenses.

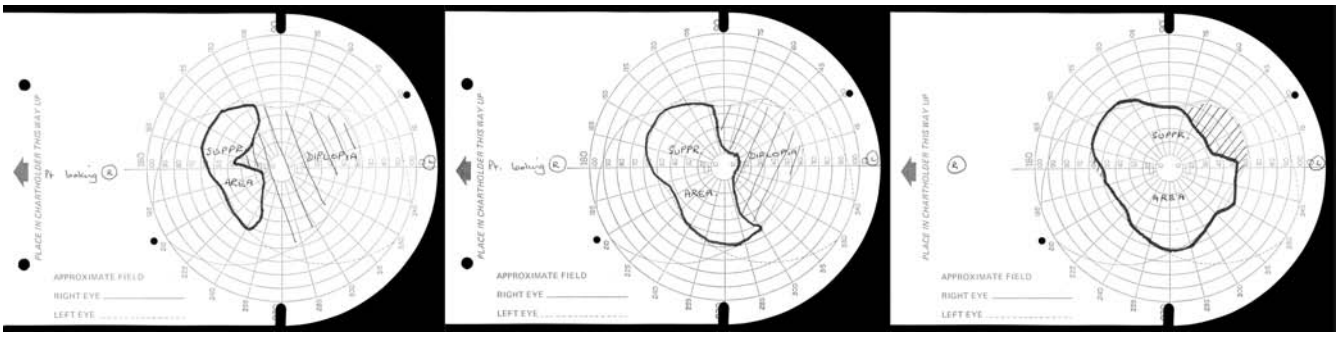

Fig. 3. Scotoma suppression without glasses (*left*), with full glasses correction (*centre*) and wearing contact lenses (*right*).

The patient's vision with contact lenses was tested at 6/4 in the right eye but still remains very poor at 1/60 in his left eye. However, his diplopia is present only on extreme laevo-version and this is not troublesome.

Discussion

The patient first presented at 10 months old with strabismus and nystagmus. Kushner reported that a squint at this age is generally a sign of a long-standing cataract,[2] Parks *et al*. reported that 100% of infants with total cataract and 43% with nuclear cataract developed nystagmus,[3] and Lloyd *et al*. showed that 83% of infants with major form deprivation had strabismus.[4] The prognosis for visual improvement at this age would have been very poor, in the light of a recent report by Abadi *et al*. showing a latent period of approximately 6 weeks before the visual system becomes sensitive to deprivation amblyopia.[5] Birch and Stager demonstrated that cataract extraction after the first 6 weeks of age leads to progressively poorer outcomes.[6] This evidence all suggests that the cataract was congenital, as opposed to acquired, and that cataract extraction was unlikely to be beneficial. Occlusion at home was very difficult and unsuccessful but nonetheless worth trying.

There were various possible solutions in this case that were considered. A 12 dioptre horizontal prism corrected the diplopia but was not a permanent solution as the patient did not wear his glasses full-time. Botulinum toxin to the medial rectus[7] would have been a short-term measure that may have relieved the diplopia and improved the cosmetic appearance in the primary position but may well have caused the left eye to diverge. An occlusive contact lens would lead to total loss of any vision in the left peripheral field. No matter how poor the vision in the amblyopic eye, patients still find it useful to see if something is moving towards them on their 'blind' side. Using Bangerter foils, occlusion on glasses/face were not found to be helpful in the patient group presented in the study by Hadid.[8,9] An intraocular occlusive lens was not feasible, as cataract removal was felt likely to cause a risk of increased intraocular pressure. (It would be interesting to see a follow-up of this group of patients[9] in future to assess how many are developing a divergent deviation and whether further cosmetic surgery is necessary.) The angle of deviation was too unstable to consider any surgical re-alignment.

My concern is about those children seen when younger, given refractive correction and treatment for their amblyopia. In cases where there is no or slight improvement in vision after occlusion, it is common practice to abandon patching and the refractive correction in the amblyopic eye. In the absence of a squint (which may be present but undetectable due to poor fixation) or a cosmetically small deviation, the patient is usually discharged to follow-up. It is possible that these patients will present again in the ophthalmology department with problems in later life.

Would it not be best practice to inform all patients on discharge about the benefits of continued wear of their refractive correction? There is little reported data on the management of older patients with anisometropic amblyopia in association with strabismus and other problems. Evidence is available about anisometropic patients in the absence of strabismus, showing that it is possible to improve the vision even over the age of 15 years, but there is no indication of whether patients were advised to continue wearing an optical correction on discharge.[10] From recent papers, it appears that trying to further penalise the vision in the amblyopic eye to eliminate diplopia – by way of Bangerter foils, occlusive contact lenses, patches on the face or glasses, or frosting of the spectacle lens – seems only to alert the brain more to the amblyopic eye and oppose the penalisation.[8,9] By using the opposite technique and giving a full correction to the amblyopic eye, the brain seems to readily accept the solution and helps to control the deviation.

I have encountered six more patients wearing a balance lens in front of the amblyopic eye in whom re-introducing the full refractive correction has produced a satisfactory solution to their problem even though the level of vision has not improved in the amblyopic eye. Several of these patients have required a small prismatic correction as well but all are continuing very satisfactorily. Balance lenses in patients are generally calculated by adding together the power of the sphere and half the cylinder power. However, if patients are very anisometropic then the lens for the amblyopic eye is purely cosmetic and would be of a similar prescription to the lens for the better seeing eye. Cost to the patient is also a consideration, as balance lenses are costed similar to the HES glasses voucher values. I have been unable to source any literature appertaining to balance lenses and their use in practice.

The challenges to the orthoptist are constantly changing with improvement in techniques and surgical treatments, for example congenital cataracts at an early age. It is important to consider both the short- and long-term solutions in the best interest of the patients and future costs to the NHS. This case was managed by a team of HES professionals, all adding their own expertise and providing the best outcome to the patient.

I would like to thank my patient for allowing me to present his case. I am also grateful to Laura Burns in Medical Illustration, UHND, for her help in producing this report. Mr R. Allchin, who performed the squint surgery in 1990, and Mr P. Tiffin, who examined the patient as a young adult, have consented to me publishing this case report. Both are consultant surgeons from Sunderland Eye Infirmary and Durham is one of their outreach centres. Janet Tonkin and Cathryn Graham in UHND library I thank for their patience and help in obtaining printed papers and textbooks from other libraries. Lastly I am grateful to Mr Ian Hickson for fitting the contact lenses, explaining the calculation of balance lenses, and being a formidable debating partner in the management of all our shared patients. Special thanks go to the reviewers for their time and helpful comments.

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