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CLINICAL STUDY

Contact lenses in the management of high anisometropic amblyopia

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Abstract

Poster at College Congress, Birmingham 2001.
Oral presentation at European Strabismus Association, Florence 2001.
Purpose **Anisometropia of more than one dioptre during the sensitive visual period may cause amblyopia. Its management requires refractive correction, and occlusion. Compliance with treatment is critical if visual improvement is to obtained. High anisometropia, poor initial acuity and mixed strabismic/anisometropia amblyopia are predictive factors for a poor outcome. We evaluated contact lens use in the management of high anisometropic amblyopia.**
Methods **Retrospective analysis of anisometropic amblyopia managed in a paediatric contact lens clinic (July 1996–July 2000), after standard amblyopia therapy of spectacles and occlusion therapy had been tried. Presenting age, acuity and refraction, duration of lens wear and occlusion, and final visual outcomes were noted.**
Results **Seven children (four male, three female) presented at age 3.5–6 years (mean 4.5). Six had myopic anisometropia 6.0–18.4 dioptres (mean 10.4 dioptres) and one 6.75 dioptres hypermetropic anisometropia. The initial corrected acuities of the amblyopic eyes were 6/18 to 1/60. Five patients used contact lenses with a range from 5 months to 4 years. Final acuities were 6/12–1/60. Two myopes with 6 dioptres anisometropia improved three to four Snellen lines, one with 8.8 dioptres improved one line. Three with >10 dioptres anisometropia did not improve. The hypermetropic patient improved part of one Snellen line.**
Conclusions **High anisometropic amblyopia is challenging to treat. In our study contact lenses improved visual acuity in myopic anisometropia of up to 9 dioptres.**

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Introduction

Amblyopia is defined as a reduction in corrected visual acuity without evidence of organic eye disease. Amblyopia results from unequal vision stimulation during the sensitive period of visual development, mostly commonly from a squint or visual deprivation caused by unequal refractive errors (anisometropia).[1] Amblyopia due to anisometropia is difficult to detect and is essentially asymptomatic unless accompanied by a squint. Compliance with amblyopia treatment is the most critical factor for predicting a successful outcome.[2] The outcome of treatment is worse in patients with higher degrees of anisometropia and the depth of amblyopia has been correlated with the degree of anisometropia.[3,4] High degrees of anisometropia cause disparity in image size between the two eyes (aneisokonia). It has traditionally been believed that anisometropia of more than 3.5 dioptres constitutes a barrier to fusion, so these patients may be left undercorrected with little chance of improving their amblyopia. A poor initial visual acuity also indicates a severe amblyopia.[4,5]

Amblyopia needs to be treated in childhood and failure to do so produces what is termed the burden of amblyopia. Patients with uniocular amblyopia are debarred from a wide variety of jobs increasing with the severity of amblyopia.[6] In addition there is a risk of future blindness should the good eye be damaged either by trauma or by conditions associated with the ageing process in later life. A Danish study[7] suggests that about 1.2% of

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people with amblyopia will eventually become visually handicapped.

Materials and methods

A retrospective review of a specialist paediatric contact lens clinic was carried out in which all patients treated with contact lenses for high anisometropic amblyopia between 1996 and 2000 were identified. High anisometropia was defined as a difference of 3.5 dioptres or more in spherical equivalent between the two eyes. The case notes were reviewed and details of age at presentation, presenting acuity and refraction were noted. All patients had rigid gas permeable contact lenses fitted by an optometrist specialising in paediatric contact lens practice. Parents were instructed in the care of the lenses and in removing and inserting the lenses. Contact lenses were worn for up to 12 h each day. Orthoptists monitored the visual acuity and occlusion therapy. Measurement of visual acuity was using the Snellen chart (ie linear method). Duration of contact lens use and visual acuity outcomes were noted.

Results

Seven patients were identified with anisometropia of greater than 3.5 dioptres treated in the contact lens clinic (Table 1). Four were male and three female. The age at presentation ranged from 3.5 to 6 years with a mean age of 4.5 years. No patient had ocular pathology other than anisometropic refractive error. All patients had prior spectacle correction and occlusion therapy for at least 4 months, without any improvement of their amblyopia before being seen in the contact lens clinic.

Six patients were myopic and one hypermetropic. The hypermetropic patient had 6.75 dioptres of anisometropia. The anisometropia of the myopic patients ranged from 6 to 18.4 dioptres with a mean of 10.4 dioptres. The corrected visual acuity in the amblyopic eye at presentation ranged from 1/60 to 6/18 Snellen.

Two patients managed the contact lenses for only 2 months (Cases 3 and 4). The other five used lenses from 5 months to 4 years. No patient had complications from contact lens use. All patients had occlusion to the non-amblyopic eye but the amount of occlusion is not quantifiable since, because of the retrospective nature of the study, it was not possible to ascertain from clinical records the exact amount of occlusion prescribed nor the actual compliance with the amblyopia therapy. The departmental policy however is to start with 2 h of occlusion each day and to double the duration of patching if no response is obtained. It is therefore likely that the majority of patients will have been started on a similar regime. After treatment with contact lenses and occlusion, the corrected visual acuity in the amblyopic eyes ranged from 1/60 to 6/12 part Snellen (Table 2). Three patients had no improvement in acuity, two had improvement of up to one Snellen line and two had improvement of three to four lines Snellen.

We found no association between age at presentation and improvement in acuity. The degree of anisometropia did correspond to likelihood of improvement in acuity. Three myopic patients with more than ten dioptres of anisometropia had no improvement in visual acuity, a myope with 8.75 dioptres anisometropia had one Snellen line improvement whilst the two with 6 dioptres anisometropia both improved several Snellen lines. The one hypermetropic patient did not succeed with contact lens use and had little improvement in visual acuity. Those children whose amblyopia improved with contact lens use showed increase in visual acuity within the first 6 months of lens wear.

Table 1 Patient data at presentation

Case	*Age at presentation (years)*	*Refraction (Right)*	*Refraction (Left)*	*Corrected visual acuity (amblyopic eye (Snellen))*
1	5.25	−13.0	−0.5/−0.75	6/60
2	3.5	0.75	−10.0	6/24
3	3.5	−2.25/−2.25	−19.5/−4.5	1/60
4	5	0	5.5/2.5	6/18
5	4.5	0.5/−1.25	−8.0/−2.0	6/60
6	3.5	0	−6/−0.5	6/60
7	6	−5.0/−1.0	0.5	4/60

Table 2 Visual acuity results after contact lens use

Case	*Anisometropia (dioptres)*	*Duration lens wear*	*Initial visual acuity (amblyopic eye (Snellen))*	*Final visual acuity (amblyopic eye (Snellen))*
1	12.25 (myopia)	10 months	6/60	6/60
2	10.75 (myopia)	4 years	6/24	6/24
3	18.75 (myopia)	failed	1/60	1/60
4	6.75 (hypermetropia)	3 years	6/18	6/12 part
5	8.75 (myopia)	2 years	6/60	6/36
6	6.25 (myopia)	failed	6/60	6/18
7	6.0 (myopia)	5 months	4/60	6/18

Discussion

Amblyopia is the commonest cause of reduced vision in childhood and affects up to 3.5% of children. The commonest causes are strabismus and unequal refractive errors. The incidence of amblyopia in a hospital population has been given as 4.7%, of whom 42% had an associated squint.[8] In a general population study the overall incidence of anisometropia in one-year-old children has been given as 6.5%.[9]

Anisometropia present in infants is often transitory and is of little risk for causing amblyopia. However infants with high anisometropia of 3 or more dioptres at age 1 year are likely to remain anisometropic at age 4 years[10] and have a significant risk of becoming amblyopic. The depth of amblyopia and the difference in refraction have been shown to be closely correlated for both myopes and hypermetropes, with a greater correlation in one study for myopes.[11] This may seem surprising as it might be expected that a child with high hypermetropia in one eye would be more likely to become amblyopic than a child with an equivalent amount of myopia, because the myopic eye can sometimes be used for close work and the less myopic eye for distance. It has been postulated that the mechanism of anisometropic amblyopia is active inhibition of the fovea to eliminate sensory interference caused by superimposition of one focused and one defocused image (Von Noorden[12]).

Amblyopia due to high anisometropia is unusual and remains challenging to manage. The standard treatment for anisometropic amblyopia is correction of any refractive error and occlusion therapy. Without treatment these children will develop dense amblyopia. Conventional management is usually unsuccessful for high degrees of anisometropia. This small series shows that there are children who can be helped with the use of contact lenses in combination with occlusion. The two patients who did not manage to use lenses for any significant period of time did not gain acuity. These were a myope with 18 dioptres of anisometropia and a hypermetrope with 6.75 dioptres. The failure to improve may be due to lack of contact lens wear but those patients with more than 10 dioptres anisometropia who did manage good compliance with contact lenses still had no improvement in acuity. The patients for whom lenses were successful were myopes with around 6D anisometropia. Although treatment of amblyopia is challenging for families, many parents are highly motivated to participate in treatment even when the prognosis seems very poor. If appropriate support is available to such motivated parents, contact lens wear can be safely used as part of the treatment for high anisometropic amblyopia. In conclusion children with anisometropic amblyopia due to high anisometropia can be treated safely using contact lenses and occlusion. In patients with 6 dioptres of myopic anisometropia, there can be a good improvement in visual acuity, but in patients with higher degrees of anisometropia, significant improvement is less likely.

High anisometropia is uncommon and difficult to treat. Because these children are asymptomatic they are often diagnosed late although in this study age of presentation did not appear to influence outcome. In such cases we believe treatment is worthwhile. Conventional treatment with glasses and occlusion treatment is unlikely to be helpful in such cases but may be worth instituting as initial management.

Contact lenses should be considered if this fails in combination with occlusion. We found children whose amblyopia improved with contact lens wear did so within the first 6 months. Many parents are keen to do all that they can to gain improvement in their child's vision and are happy to undertake contact lens treatment once appropriately instructed. This study provides information about the success possibilities in such cases and can be used to guide treatment modalities. A randomised controlled trial of contact lens treatment in high anisometropic amblyopia would be helpful. However since it is a rare condition it may take a long time to recruit sufficient patients.

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