Effect of spectacles on changes of spherical hypermetropia in infants who did, and did not, have strabismus

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Abstract

Aim—To explore why emmetropisation fails in children who have strabismus.

Methods—289 hypermetropic infants were randomly allocated spectacles and followed. Changes in spherical hypermetropia were compared in those who had strabismus and those who did not. The effect of wearing glasses on these changes was assessed using t tests and regression analysis.

Results—Mean spherical hypermetropia decreased in both eyes of “normal” children (p<0.001). The consistent wearing of glasses impeded this process in both eyes (p<0.007). In the children with strabismus, there were no significant changes in either eye, irrespective of treatment (p>0.05).

Conclusions—In contrast with normal infants, neither eye of those who had strabismus emmetropised, irrespective of whether the incoming vision was clear or blurred. It is suggested that these eyes did not “recognise” the signal of blurred vision, and that they remained long sighted because they were destined to squint. Hence, the children did not squint because they were long sighted, and glasses did not prevent them squinting. (Br J Ophthalmol 2000;84:324–326)

Children who have strabismus fail to emmetropise, and we found deficient resting, or tonic, accommodation in both eyes before infants squinted. This complemented other reports of “weak” accommodation in such eyes and was probably not the result of “failed” emmetropisation. Although reduced accommodation has been thought to impede emmetropisation, the clarity of visual input is considered to be the main factor controlling eye growth. In order to explore further the association between deficient accommodation, emmetropisation, and strabismus, the data from a randomised trial of treating hypermetropic infants with glasses have been re-examined. We have assumed that the prime effect of glasses was to clear vision, and we have concentrated on changes in the spherical refraction, because infants’ eyes naturally focus on the less hypermetropic meridian. Changes in astigmatism are considered separately.

Sample and methods

In all, 615 (9.18%) of 6700 unselected 6 month old infants who attended for “screening” after instillation of cyclopentolate 1% had more than +5.25 D hypermetropia in at least one meridian. Approval was obtained for 372 (60.5%) of these to be randomly prescribed glasses (2.00 D less than the retinoscopy figure for each meridian) for constant wear. Those wearing glasses had non-cycloplegic refraction, through their glasses, at all follow up attendances, and the prescription was amended until the cycloplegic refraction of both eyes indicated less than +1.50 D astigmatism, when glasses were discontinued. They were subdivided according to whether they were deemed (by observations at each attendance)
to be wearing glasses consistently (T+, n=67) or not (T+/−, n=80). A total of 77 had a squint (five exotropia) diagnosed by the cover test and 23 a microtropia diagnosed by the 4 dioptr prism test. The mean initial astigmatism of the fixing eyes of those who had strabismus was significantly (p<0.001) less (0.31 D) than in those who did not, but there was no difference (p>0.50) in the non-fixing eyes.

All the refractions were done by RMI, and unaltered cycloplegic retinoscopy figures are quoted. The last retinoscopy was done when a squint was diagnosed (mean 37.99 (SD 11.67) months) or at 42+ months (mean 44.18 (7.21) months). Eyes of “normal” children were designated as “fixing” or “non-fixing” according to their vision or last refraction. If these were equal, they were randomly designated.

The clinical data were analysed using EPI-INFO and SPSS software, t tests, and multiple linear regression.

Results

Because of low numbers, the 23 children with microtropia were combined for analysis with the 73 who had squint, and are referred to as the “strabismus” group. Mean hypermetropia decreased significantly (p<0.001 using paired sample t tests) in both eyes of the normal group (see Table 1), but not in the strabismus group (p = 0.06 for fixing eyes, p = 0.24 for non-fixing eyes).

Each of the three treatment subgroups of the normal children showed a significant reduction (p<0.001) of the mean hypermetropia in both eyes, though the reduction was smaller in the T+ group (that is, those who consistently wore glasses). To explore this further, linear regression (see Fig 1) was used to relate the final value of hypermetropia (y) to its starting value (x), with differences in slope of the regression lines being used to compare responses to the three treatments—T0, no

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**Figure 1** Effect of spectacles on changes in spherical hypermetropia of normal children (linear regression with 95% confidence intervals).
with congenital retinal abnormalities. Failure to emmetropise and strabismus might be caused by one, or both, of blurred vision, and that both these defects were stimulated by blurred vision, but these strabismic children failed to emmetropise irrespective of whether their vision was blurred, or cleared by glasses. We suggest that deficient emmetropisation and deficient accommodation, found before children squinted, could be the result of an inability to recognise (or respond to) a stimulus of blurred vision, and that both these defects and strabismus might be caused by one, or congenital, lesion. This might be situated in the retina of both eyes, because failure to emmetropise has been reported in association with congenital retinal abnormalities. Finally, if these children had squinted because they were long sighted, and blur induced accommodation had “switched on” accommodation when it had previously not done so, and why did glasses, which should have nullified any need for extra accommodation, prevent them from squinting? We suggest that the sequence of events is that (i) they remained long sighted because they were destined to have strabismus, and (ii) disparity/diplopia initially triggered convergence driven accommodation, which may then interact with accommodative vergence, permitting glasses to have some effect, but neither a curative nor a preventive one.

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