

Albinism: a personal case study

Dr Brian Evans provides an interesting case study on vision correction and albinism and proposes that our understanding of presbyopia in this condition may need revision



Brian Evans: investigated his own eyes

I AM A BLOND CAUCASIAN male aged 62 with a visual acuity in both eyes of about 6/18. I have a pendular nystagmus, high cyl, photophobia, no foveal pit, no binocular vision and can suppress each eye at will. In 60 years of eye care no one has ever mentioned the 'A' word – albinism. This I belatedly found out for myself about four years ago.

When I was five years old I remember peering into an instrument that read 'on' in one eye and 'one' in the other. The two images did not converge. In the 1960s, I used Freddie Hodd and George Nissel's haptic contact lenses which did improve my VA, but my nystagmus destabilised the tear film after a short period.

I am an engineer by profession and hold a PhD in medical physics from Barts. I am familiar with research culture so I decided to investigate my own eyes – with a lot of help from several eye care professionals.

Keratometry measurements of my right

eye indicate an anterior corneal 'with the rule' astigmatism of about five dioptres. An Orbscan topography of anterior and posterior surfaces indicates a cyl of 5.40 dioptres (Figure 1). Overall R refraction is approximately +2.25/ -6.75x175. L is similar at +1.00/ -6.25x5.

I shall quickly address the dispensing problems of such a high cyl. The order of the lenses in the trial frame affect the vertex correction – as does the unknown horizontal and vertical angles of the spectacle frame. Not least of the variables is my choice of lens refractive index and the lens lab's choice of base curve of the lens which can subsequently affect

the vertex distance. To minimise these variables I have stuck to the same lens manufacturer, the same index and the same frame.

I have tried a combination of glasses and toric contact lenses to share the cyl and have worn the Mark Ennovy 5T toric with some success. I followed the fitting guide that is based on k values and tried a number of cyl values from 0 to 6.00DC. I discovered, however, that the contact lens VA dropped sharply as I approached the anterior corneal cyl value of approximately 5.00DC despite trying a range of base curves. The 6.00DC lens did not fit at all. At 4.00DC the lenses work well. They are comfortable and are stable to within a few degrees.

The combination of glasses and contact lenses creates a range of possibilities. I have tried a dark opaque coating on the iris area of the contact lens (with a clear 6mm diameter pupil area) and this works in reducing trans-illumination (Mark Ennovy 5T plus a bespoke coating from David Thomas).

I have also tried the addition of -5.00DS to the contact lens script and a +5.00DS addition to the glasses' prescription in order to simulate the magnification of a Galilean telescope. This raises my VA from 6/18 to 6/9, but at the cost of a reduced field of view. Vertex distance is critical.

The foregoing refracting techniques are slightly out of the normal range, but success requires only some care in measuring vertex distances and a little adaptation. What follows is less expected.

The absence of binocular vision and the ability to voluntarily suppress each eye has allowed me a wider choice in the selection of prisms that can modify the angle of gaze. I can tolerate 15 dioptres of base-in prism, 12 dioptres of base-out prism and six dioptres of base-up/down prism across both eyes.

My Orbscan pachymetry scan indicated that the minimum corneal thickness was offset from primary position by about six base-out prism dioptres. I used a range of prisms over a range of angles to determine whether my VA would improve if I altered the angle of gaze. I discovered that at certain powers and angles my refractive error changed and that there was a significant change in the aspect ratio of the target at certain prism settings. The change of aspect ratio was a direct indication of a change of astigmatism in my eye. The cyl value changed from about 6.50DC in the primary position to about 5.75 DC through a gaze shifting prism. VA was slightly improved and accommodation appeared to improve.

How might this occur? My own refrac-

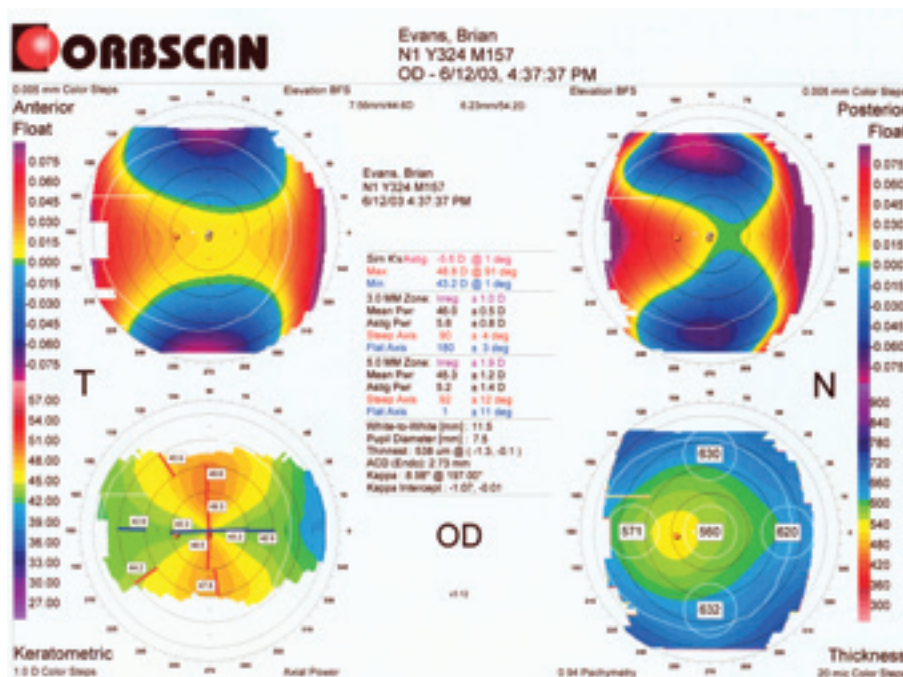


FIGURE 1. Orbscan profile of right eye

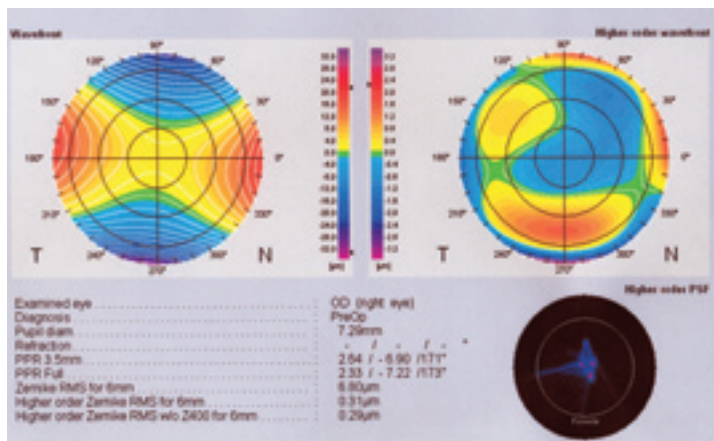


FIGURE 2. Aberrometry values for right eye

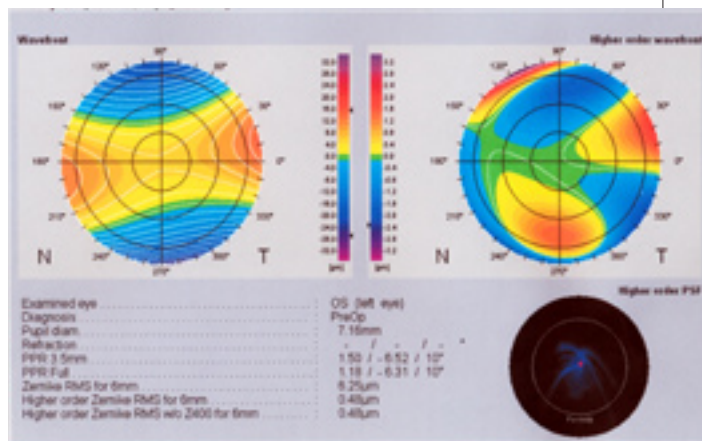


FIGURE 3. Aberrometry values for left eye

tion (by myself and others) has been beset with variability. R cyl can vary from 6.25 to 7.25 and L cyl from 6.00 to 6.75DC. Successive autorefractors indicate the same range of values.

If the same tests are run with the inclusion of a 5.5 dioptre base-out prism then the R cyl varies from 5.50 to 6.25, L 5.25 to 6.00DC. I get the same result from a Nidek 9000 autorefractor when the prism is held between my eye and the machine.

The earlier Orbscan plots indicated a corneal astigmatism of 5.4DC, so I presumed that the remaining astigmatism is lenticular – ranging from near zero to a value of about 1.75DC. A prism appears to set the lenticular astigmatism in the lower half of this range, whereas a straight ahead gaze appears to elicit a value of astigmatism in the upper half of the range. Within these two sub-ranges it appeared I had no control over the value and how it varied with time. It helped explain how the many pairs of spectacles which had been prescribed to me, and with a similar range of cyls, all appear to be okay at some time during the day.

When I was a child I was prescribed a cyl of about four dioptres. In the 1940s, it was thought that a partial correction would be best for a young eye. In the 1960s, Freddie Hodd moved me up to a full correction of 6.25 DC. This value certainly lies in the full correction ballpark – but was

it the best strategy? Would a partial correction methodology be a better idea?

I have tried a refractive correction of 5.50DC which matches my corneal cyl. In effect, I am ignoring the (variable) cyl contribution of the crystalline lens. I am telling the crystalline lens to behave itself and to make a zero contribution to my astigmatism. It seems to work.

My eyes are an example of lenticular astigmatism adding to the corneal element. The reverse is also true. I have met albinos with an overall cyl requirement of four dioptres but with k values that suggest corneal astigmatism approaching six dioptres. Should they be prescribed the upper or lower figure?

All this presupposes that the crystalline lens is capable of producing a wide change in cyl values. Conventional wisdom suggests it does not.

It was with some interest that I tested the Imagine Eyes aberrometer on display at the European Conference of the Physiology of the Eye, hosted by City University in September 2006. The aberrometer was set up to track my accommodation over a five dioptre change in target distance. There was no change in sphere but there was a substantial change in cyl. OD cyl changed from 6.30 to 7.20DC without a prism and from 5.40 to 6.20DC with a 5.50 dioptre prism in place. No one believed the resulting graph, so

we did it again – twice – on each eye. The cyl range was the same but the order of the changes was quite different each time.

The findings appeared to show that the crystalline lens could change its cyl – even in a 62-year-old whose sphere accommodation was near zero. It also appeared to show the change was random.


Although this is an unexpected result, may I hypothesise how the physiology of the ciliary body and the crystalline lens might allow a change in lenticular cyl in an ageing eye with an inelastic lens. If some muscles in the ciliary body retained their tone, then they might succeed in changing the lens from a circular to an elliptical shape – without the need to increase the length of the circumference of the now inelastic lens.

The clinical issue is that some or all of the muscles in the ciliary body of an albino eye can produce unpredictable variations in astigmatism. To say the least, these changes are most inconvenient. Do these variations occur in other eye pathologies such as Down syndrome children who can also unexpectedly lose accommodation?

Might my best course of action be to elect for a clear lens exchange and a progressive spectacle lens in order to stabilise my refractive error?

◆ *Dr Brian Evans is a retired researcher in medical physics*

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