

Franklin bifocal, a solution for prismatic correction of paralytic strabismus

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Abstract

A Franklin bifocal gives one the possibility of doing a sector prism to replace a Fresnel prism in cases of paralytic strabismus. Thus, visual acuity and the aesthetic aspect of the equipment can be enhanced.

The Fresnel prism is an effective way of maintaining fusion in cases of paralytic strabismus¹. Its low weight for high prismatic correction and the possibility of positioning it on one portion of the lens are its main advantages^{2,3}. On the other side, its unaesthetic aspect and the visual acuity drop associated with it are less appreciated³.

Our subject, A.R. (87 years old), has shown a paralytic strabismus of idiopathic origin for 15 years. Surgery performed 5 years ago was ineffective. Her main complaint concerns the unaesthetic aspect of her actual prescription. She is wearing a 15 Δ base down Fresnel prism on the superior portion of her left lens. There is no prism on the inferior portion of that lens, neither on the right lens.

Her visual acuities, with her present correction are:

O.D. -0.75/-2.00X90° 6/18⁺²
 O.S. -0.75/-2.00X90°
 15 Δ Base down
 (Fresnel) 6/18
 Add. +4.00 0.26/0.8
 (0.8M at
 26 cm)

The actual state of refraction is:

O.D. -0.75/-2.00X90° 6/18⁺²
 not
 improvable
 O.S. -0.75/-2.00X90° 6/12
 not
 improvable
 Add. +4.00 0.26/0.8
 (0.8M at
 26 cm)

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Maddox rods were used to examine the deviation in the nine positions of gaze. These results (Figure 1) confirm that she needs the prism power for far vision only.

To fulfill the patient's request, we had to find a way of eliminating the Fresnel prism. But we wanted to keep and enhance, if possible, the quality of the binocular vision present with the actual equipment. The idea of a slab-off prism was rejected because of the high prismatic correction. We used a bifocal like the one designed by Benjamin Franklin back in 1784⁴.

The original Franklin bifocal featured a halved distance lens and a halved near correction placed in juxtaposition and held together by a circular metal rimmed frame. By using this procedure, it was possible to introduce by surfacing the prism power needed in the superior portion of the lenses only. The prismatic prescription was shared out between the two eyes in the following way: 10 Δ base up on the right eye and 4 Δ base down on the left eye. This distribution was done to minimize the thickness at the dividing line of the left lens and the thickness at the superior edge of the right lens.

At the delivery of the equipment presented at figure 2, diplopia was absent in the primary and reading positions. The visual acuities were:

O.D. -0.75/-2.00X90°
 10 Δ Base Up 6/18
 O.S. -0.75/-2.00X90°
 4 Δ Base down 6/12⁻²
 Add. +4.00 0.26/0.8
 (0.8M at
 26 cm)

The patient was satisfied both by the appearance and the vision achieved with her new prescription. The change of ocular dominance brings an improvement in visual acuity without causing any ocular discomfort.

The visual acuity obtained with a conventional prism is better than that obtained with a Fresnel prism, but worse than that obtained without any prism. This observation is in agreement with the results reported by Borish⁶.

The different types of distortions described by Adams et al.⁷ and the transverse chromatic aberration associated with every kind of prism can explain the visual acuity loss. However, there appear to be additional acuity reducing factors with Fresnel prisms. Reflections at the prism facets and increased chromatic dispersion produce a loss in contrast of objects viewed through a Fresnel prism².

In cases of paralytic strabismus where different prismatic corrections are required for far and near vision, one can prescribe occupational unifocal lenses, use sector Fresnel prism or realise a bi-prismatic correction. When a prismatic correction of any kind is considered, Fresnel prisms should be used on a temporary basis to make sure that the symptoms will be relieved with prisms. Afterward, if needed for aesthetic purposes, conventional prisms could be used and realised as a slab-off for small prismatic powers or as a Franklin bifocal for large prismatic corrections.

References

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