Considering Apical Scotomas, Confusion, and Diplopia When Prescribing Prisms for Homonymous Hemianopia

Henry L. Apfelbaum¹, Nicole C. Ross¹,², Alex R. Bowers¹,², Eli Peli¹,²
¹ Schepens Eye Research Institute, Massachusetts Eye and Ear, Harvard Medical School, Boston, MA, USA
² New England College of Optometry, Boston, MA, USA

Figure S1. Unilateral Horizontal 40Δ Peripheral Prisms, with gaze shifted. With the lower power the prisms show more diplopia when gazing to the left and a smaller gap when gazing to the right than the 57Δ prisms of Figure 12. (A) With gaze shifted left 15°, more of the blind hemifield is visible in the prisms. Since the prism shift is less than the visible width of the prisms, there is diplopia in the overlap regions (crosshatched). (B) The corresponding percept diagram shows the visual confusion in the prism regions, combined with diplopia (outlined and lightly shaded in prism view locations where it offers no expansion benefit). (C-D) Unlike sector prisms, when gaze is shifted 15° away from the blind side, the prisms still provide field expansion, providing some continued access to activity in the important region straight ahead of the wearer.
Figure S2. An oblique 57Δ prism with power 29.7 degrees and apex-base angle 30° is equivalent to combining a vertical prism with power $29.7 \times \sin(30) = 14.8°$ (26.5 Δ) and a horizontal prism with power $29.7 \times \cos(30) = 25.7°$ (48.1 Δ). Press-On prisms (3M, Minneapolis, MN) used in this figure are all the same shape and size and are centered (except for d) on the left lens of a normally-sighted subject, with OD patched. The solid outlines indicate the approximate prism locations, while the dashed outlines indicate the field seen in the prisms. (A) Visual field diagram with a 40Δ base left (horizontal) prism on the rear of the carrier lens, showing an apical scotoma the height of the prism and the width of the prism power (21.8°). (B) Diagram with a 15Δ base down (vertical) prism on the front of the carrier lens, showing an apical scotoma the width of the prism and the height of the prism power (8.5°). (C) Diagram with both prisms in place, showing the combined scotoma. (D) Diagram using an upper segment 57Δ oblique peripheral prism with apex-base angle 30°, showing a similar scotoma.

Figure S3. Unilateral oblique 57Δ peripheral prisms provide access to pericentral regions even when gaze is shifted from primary. (A) Simulated Goldmann visual field diagram with gaze shifted 15° left. (B) The corresponding percept diagram shades the diplopic portion of the prism view that does not contribute expansion. There is peripheral (retinal), but not central, diplopia. (C-D) With gaze shifted right 15°, some pericentral expansion is still provided, with no diplopia.
Figure S4. Unilateral oblique 40Δ peripheral prisms, ±30° apex-base angle, provide access to pericentral regions. (A) Simulated Goldmann visual field diagram shows true expansion with no apical scotomas at primary gaze, but there is some peripheral diplopia. (B) The percept diagram shows the areas of visual confusion associated with unilateral fitting, and the shading indicates the (peripheral) diplopic regions that do not contribute to expansion. (C-F) Corresponding calculated diagrams with gaze shifted 15° left and right, respectively, as shown by the arrows.
Figure S5. Diagrams similar to those in Figure 17, with 40Δ rather than 57Δ prisms. Lower power results in larger areas of diplopia.

Figure S6. In this example, 57Δ prisms are fit bilaterally, with the upper prisms offset temporally with respect to each other. Offsetting oblique prisms horizontally does not compensate for the vertical component of the apical scotomas and results in wasteful peripheral diplopia. Unilateral fitting is preferable.