Homonymous Hemianopia
For Prism Power Variation by Angle of Incidence
Magnification and
In The field
Monocular diplopia
Prism power varies with angle of incidence
At primary gaze the
Apical Scotoma is
Total Internal Reflection (TIR)
In OPS
The actual prism view is slightly
Deflection angle is highly dependent on the
With gaze shift to blind side
Outward Prism Serration (OPS)
For high
The size of
For 57∆
Low power prisms (i.e. 20∆)
At primary gaze
Light rays split on surfaces into
Eyeward
considered when prescribing prisms for visual field expansion
EPS: Increasing
Configuration prism power and its variability are reduced
Small prism power blocks views beyond ≈5°
Deviations 
view through 
(5000)
TIR on base
Surface reflection 1
Surface reflection 2
• With gaze shift to blind side
EPS: Magnification is almost constant (almost CDA), minimal distortion
OPS: Increasing magnification (distortion) until TIR, larger expansion dim and narrow
• At primary gaze
EPS: Magnification, field expansion is smaller, apical scotoma is smaller
OPS: Minification, field expansion is larger, apical scotoma is smaller
• Eyepiece Prism Serration (EPS): Configuration commonly used for press-on prism
• Outward Prism Serration (OPS): Configuration used for permanent PMMA Fresnel prism

Impact of high power and high incidence angles on peripheral prism for homonymous hemianopia
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Introduction
• Homonymous Hemianopia (HH) occurs due to stroke, head injury or brain surgery
• Peripheral Prisms1,2 (2000)
Expand upper and lower segments of the lateral visual field using Fresnel prisms

Distortion and Reflections in High Power (57∆) Fresnel Prism

Prism Power Variation in High & Low Power Prisms
Low power prisms (i.e. 20∆) Prism power is almost constant (CDA: constant deflection angle) CDA = Nominal power across a range of gaze shift (≈15°)
High power prisms (i.e. 57∆) Prism power varies with angle of incidence within practical range of gaze movements

OPS and EPS Configurations
• Goldmann and percept diagram Gaze shift toward blind side (20°)
• Goldmann and percept diagram Gaze shift toward blind side (10°)

Simulated Views in Primary Gaze, 10° and 20° Gaze Shifts to the Blind Side

Acknowledgement and References

1) E. Peli (2000)
Field expansion for homonymous hemianopia by optically-induced peripheral esotropia,
Optometry and Vision Science, 77(9), 453-464
2) E. Peli (2008)
Peripheral Field Expansion Device, United States patent 7,374,284
Considering optical scotomas, confusion, and diplopia when prescribing prisms for homonymous hemianopia,
Translational Vision Science & Technology 4(1), article 2
Impact of high power and angle of incidence on prism corrections for visual field loss,
Optical Engineering 53(8), 081707, Open Access

Acknowledgement and References

• Prism power varies with angle of incidence
  – For low prism power (20∆)
    – The variations within the range of practical gaze shift (≈15°) are very small
  – For high-power prisms (57∆) The effective deflection varies with angle of incidence, and these effects must be considered when prescribing prisms for visual field expansion

In OPS configuration
– The field-of-view through the prism is wider and therefore more compressed
– For 57∆ TIR blocks views beyond +5° into the blind side which limits the effects of scanning
– Apical Scotoma is smaller (can cause diplopia)
– At primary gaze the TIR on base appears in the blind hemifield in its dimmer surface reflections appear at the seeing hemifield

In EPS configuration prism power and its variability are reduced
– The actual prism view is slightly magnified by the reduced prism power. The effect of scanning is not limited
– At primary gaze the TIR on base and the surface reflection appear in the visible hemifield and can cause visual confusion, diplopia, & bright false alarms

Conclusion

• This work was supported in part by NH grants EY12880 and EY023385 (EP), and the Basic Science Research Program (2014R1A6A3A03038820), National Research Foundation of Korea (NRF), the Ministry of Education, Science and Technology (2014R1A1A2A10051679)
• Dr. Peli has patent rights (assigned to Schepens Eye Research Institute) for the peripheral oblique prisms (Licensed to Chadwick Optical)

1) E. Peli (2000)
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