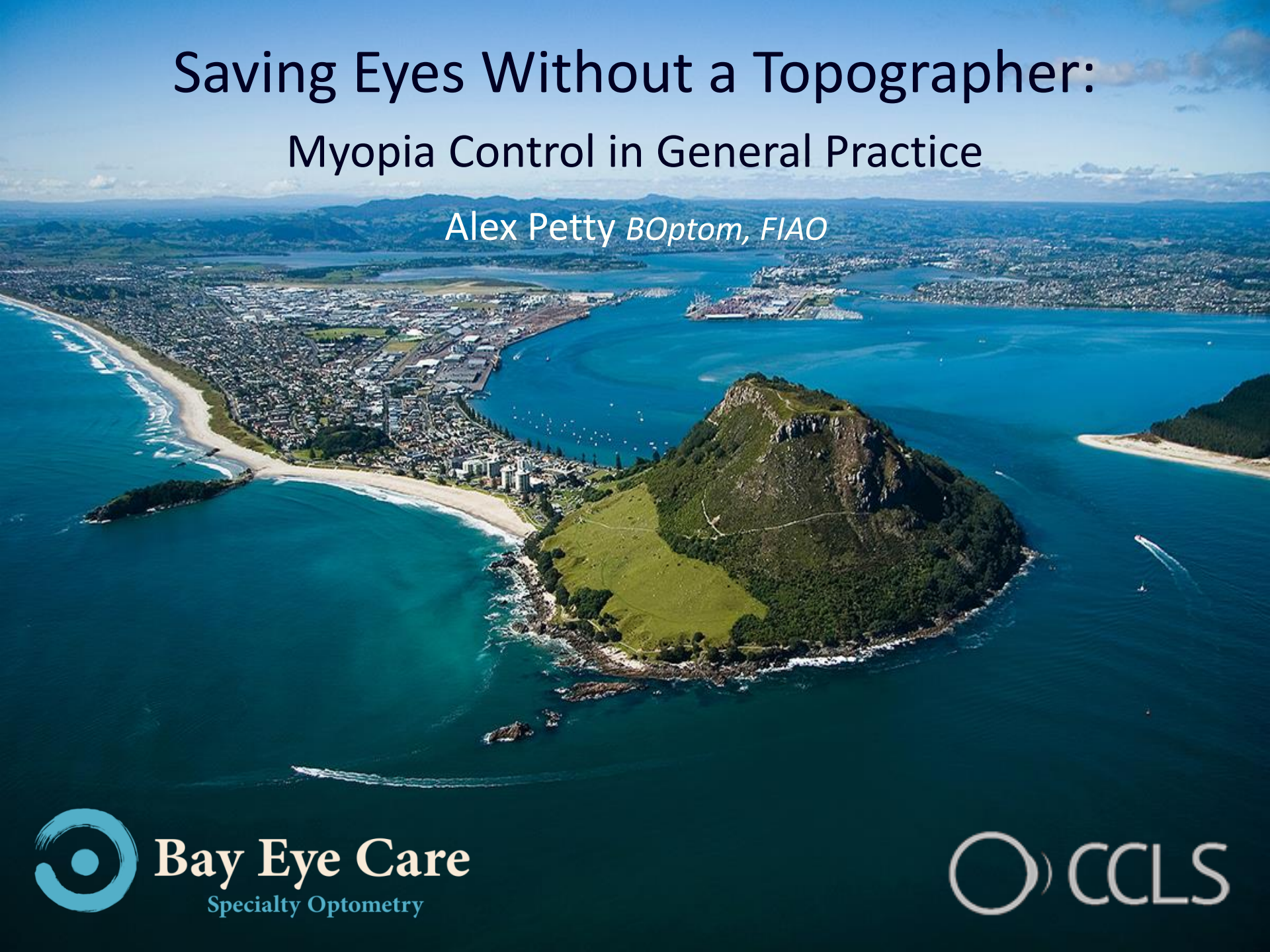
Saving Eyes Without a Topographer:

Myopia Control in General Practice

Alex Petty *BOptom, FIAO*



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Alex's Background

- New Zealand trained Therapeutic Optometrist *(BOptom Hons.)*
- Interests include orthokeratology, myopia control, specialty contact lens fitting, dry eye & acute and chronic ocular disease management.
- Fellow of the International Academy of Orthokeratology *(FIAO)*
- Director/Optometrist of specialty optometry practice Bay Eye Care in Tauranga.
- No financial interests to disclose.

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Myopia – why do we care?

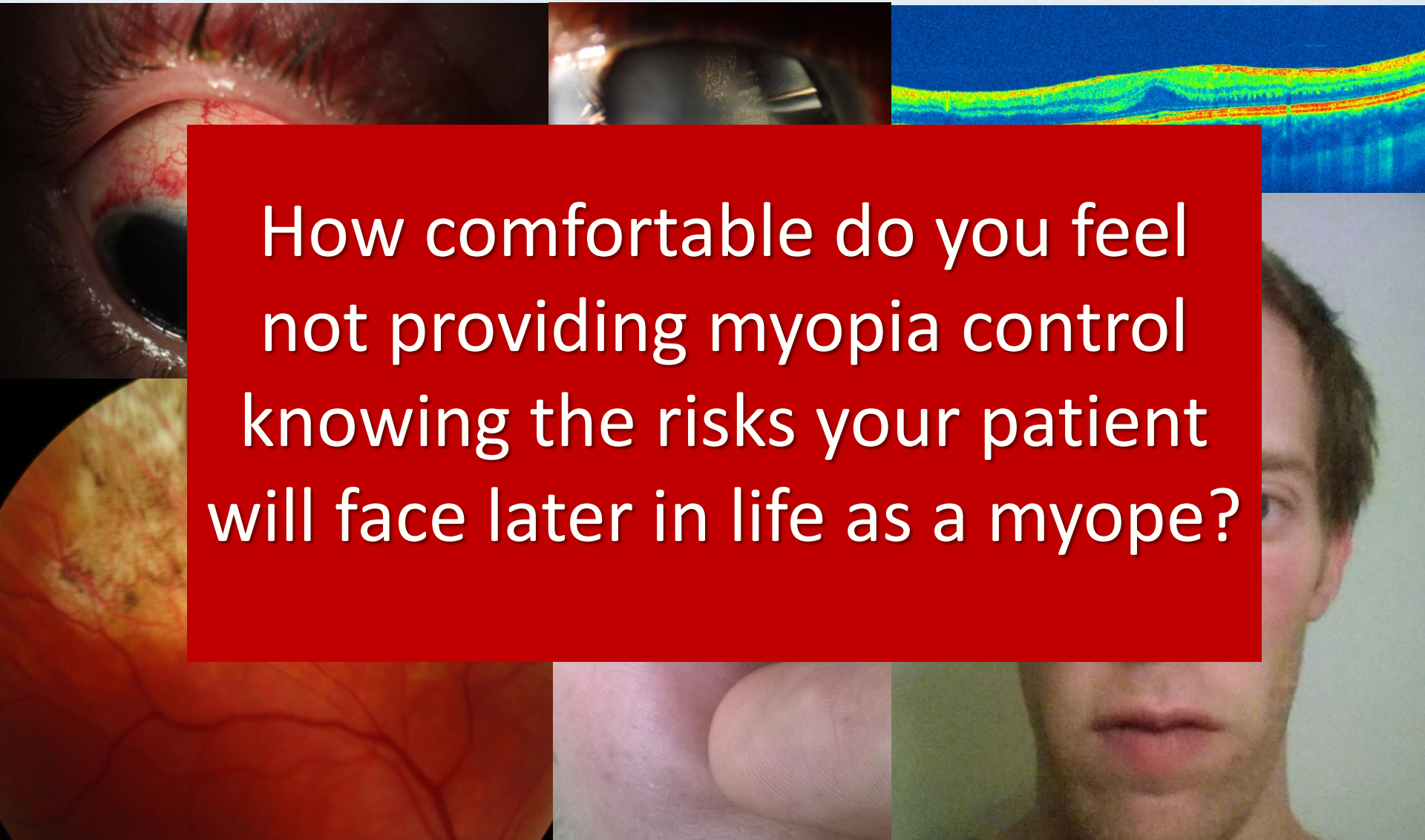
- Currently myopia affects 23% of the world's population
- 12% of these myopes have high myopia (-5D or worse)
- Predictions suggest that by 2050 49.8% of the world will be myopic with 20% of these being high myopes! Holden et al 2016

So what is the issue with myopia?

- All levels of myopia increase the risk of ocular disease: there is no 'safe' level of myopia.
- **Myopia** represents a risk factor for **ocular disease** that is *greater* than the risk of **cardiovascular disease** associated with **untreated hypertension**
- Also greater than the risk of **stroke** from **smoking >20 cigarettes per day**. Flitcroft 2012
- Individuals aged 75 with myopia and high myopia have a 4% and 39% cumulative risk of visual impairment respectively. Tideman 2015

	Cataracts	Glaucoma	Retinal Detachment	Myopic Maculopathy
-1D to -3D	2 x	4 x	3 x	2 x
-3D to -6D	3 x	4 x	9 x	10 x
> 6D	5 x	14 x	22 x	41 x

An example of when myopia goes bad..

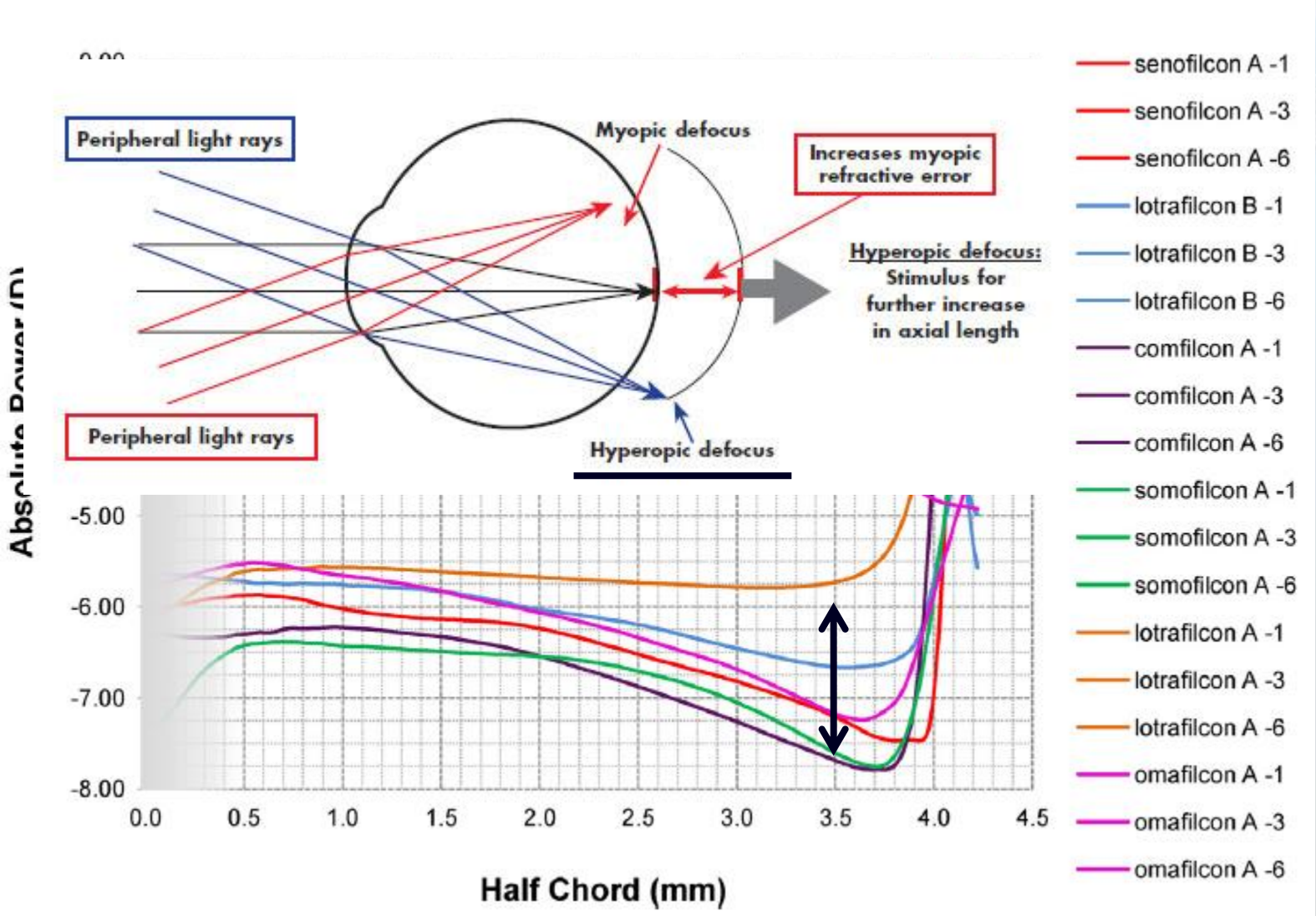


How comfortable do you feel not providing myopia control knowing the risks your patient will face later in life as a myope?

Myopia Control in general practice: What not to do!

- Leave uncorrected or under correct.
  - *This makes myopia progression worse!* Adler 2006, Chung 2002
- Prescribe single vision spectacles.
  - Typically the control group in studies.
- Prescribe single vision contact lenses
  - *0-5% myopia control effect* Katz et al 2003, Walline et al 2004, 2008.

Power profiles of common single vision soft contact lenses



Oasys

Air O2 Aqua

Biofinity

Clariti

Night & Day

Proclear

Wagner et al 2014 CLAE

Myopia Control in general practice: What not to do!

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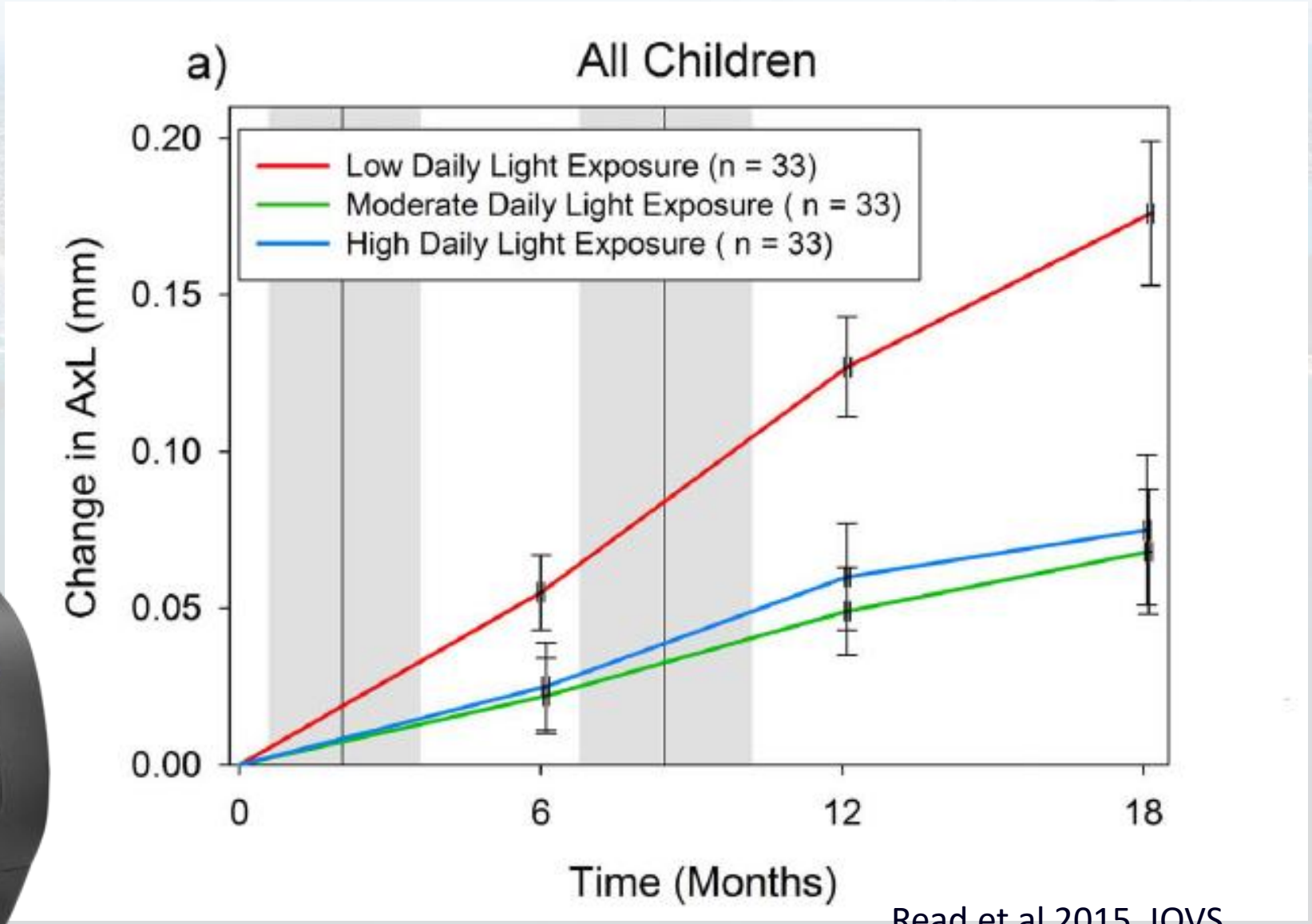
  - *0-5% myopia control effect* Katz et al 2003, Walline et al 2004, 2008.
- Do not discuss **outdoor time** and **screen/device time**.
  - Recent interventions show positive effects from increasing outdoor time by 40-80 minutes a day. He et al 2016
  - However meta-analysis suggests outdoor time is protective for the onset but not progression of myopia. Xiong et al. 2017

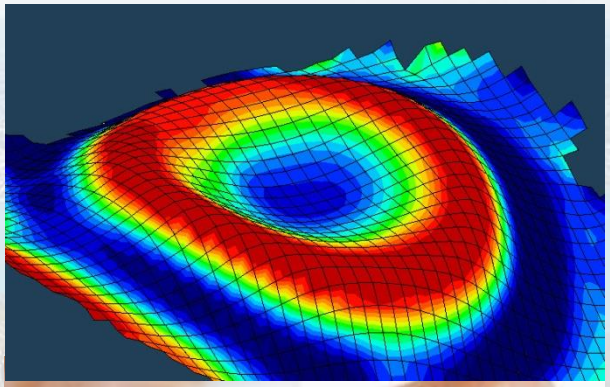
The effect of light exposure on axial eye growth

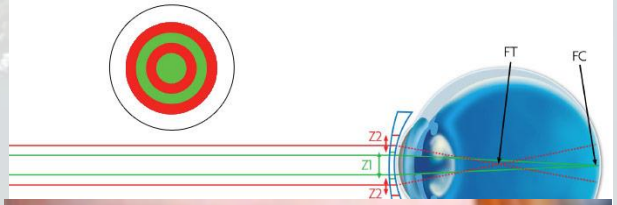


Read et al 2015. IOVS

Myopia Control Options

- Orthokeratology
  - 32-100% slowing
- Atropine
  - 30-77% slowing
- Multifocal soft contact lenses (incl MiSight)
  - 29-59% slowing
- Bifocal/PAL spectacle lenses
  - 12-55% slowing





Myopia Control Options without a topographer

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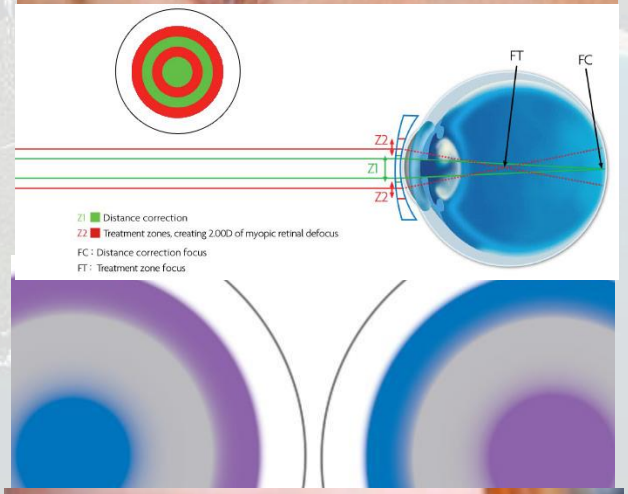


Atropine

- Myopia control effect was initially thought to be related to the effect on the ciliary body.
- However studies showed that reading alone was not a predictor of myopia development Jones 2007
- 0.01% atropine shows ~65% slowing of myopia with negligible effect on accommodation. Chia et al 2012

Effect of atropine on the choroid

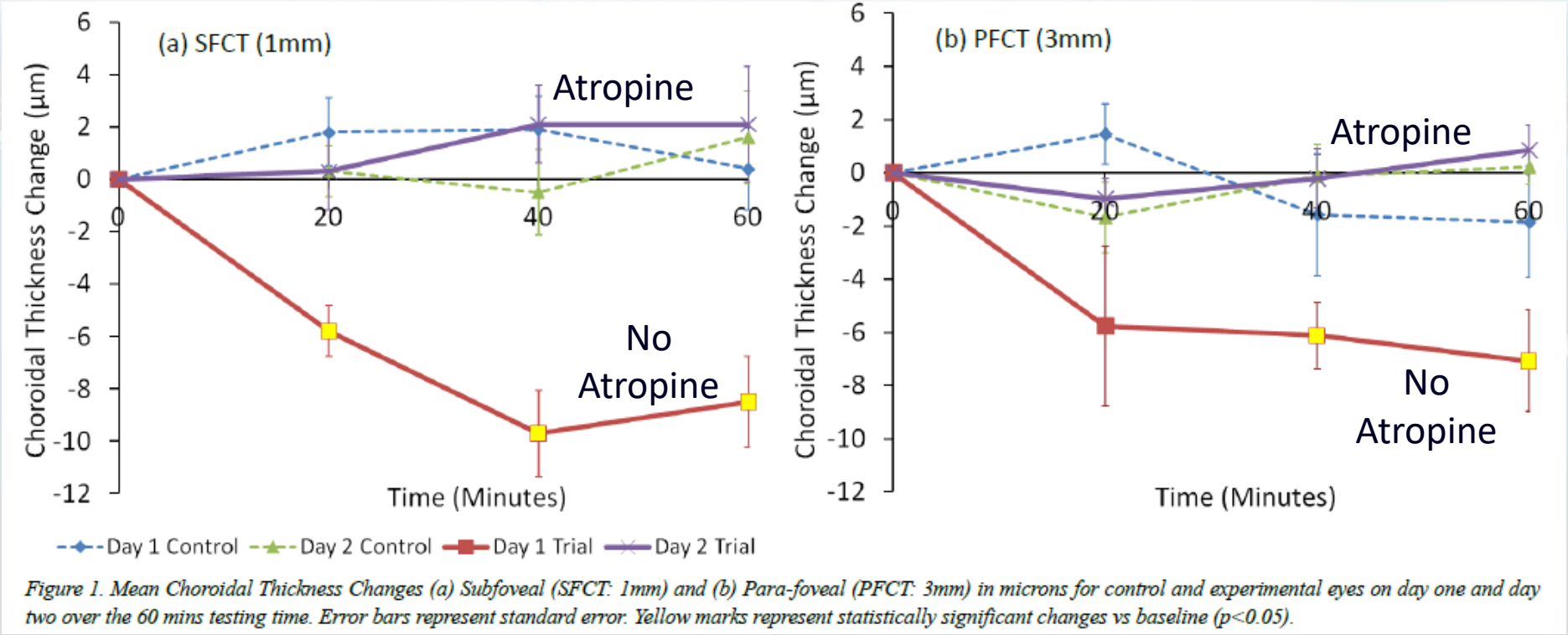


Figure 1. Mean Choroidal Thickness Changes (a) Subfoveal (SFCT: 1mm) and (b) Para-foveal (PFCT: 3mm) in microns for control and experimental eyes on day one and day two over the 60 mins testing time. Error bars represent standard error. Yellow marks represent statistically significant changes vs baseline ($p<0.05$).

- By acting directly on the choroid or disrupting the signal atropine eliminates the normal choroidal thinning response to hyperopic defocus

Chiang et al 2015

Atropine in practice

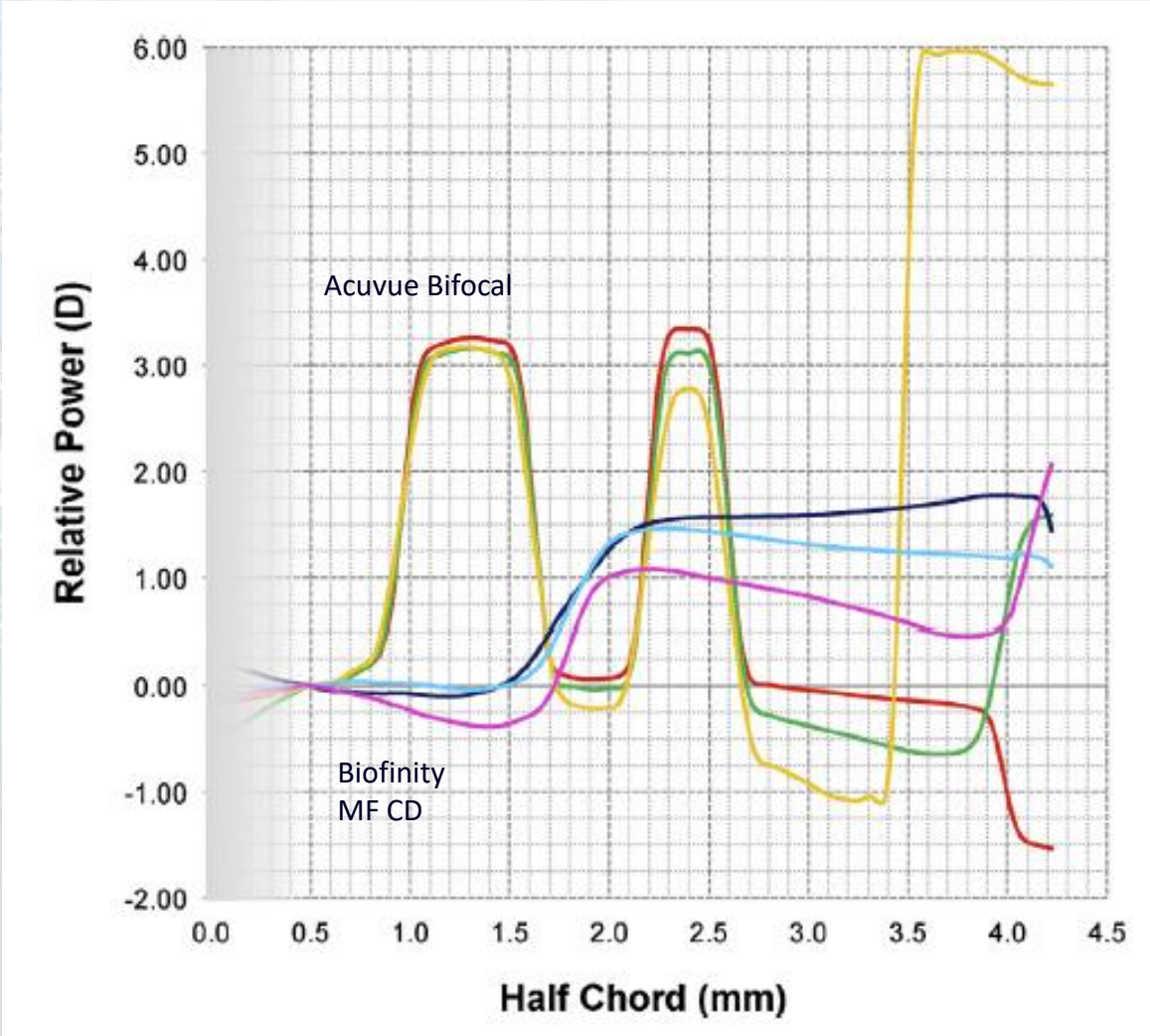
- Concentration?
  - 1% atropine creates significant mydriasis, photophobia and cycloplegia
  - ATOM2 study showed that low dose atropine (0.01%) had comparable myopia control effect to higher concentrations, and a slower rate of progression following cessation.
  - In contrast Shih et al 1999 found the concentration of atropine *was* related to myopia control effect.
  - Cooper et al 2013 determined that the maximum concentration of atropine that did not cause clinical symptoms was **0.02%**

Atropine in practice

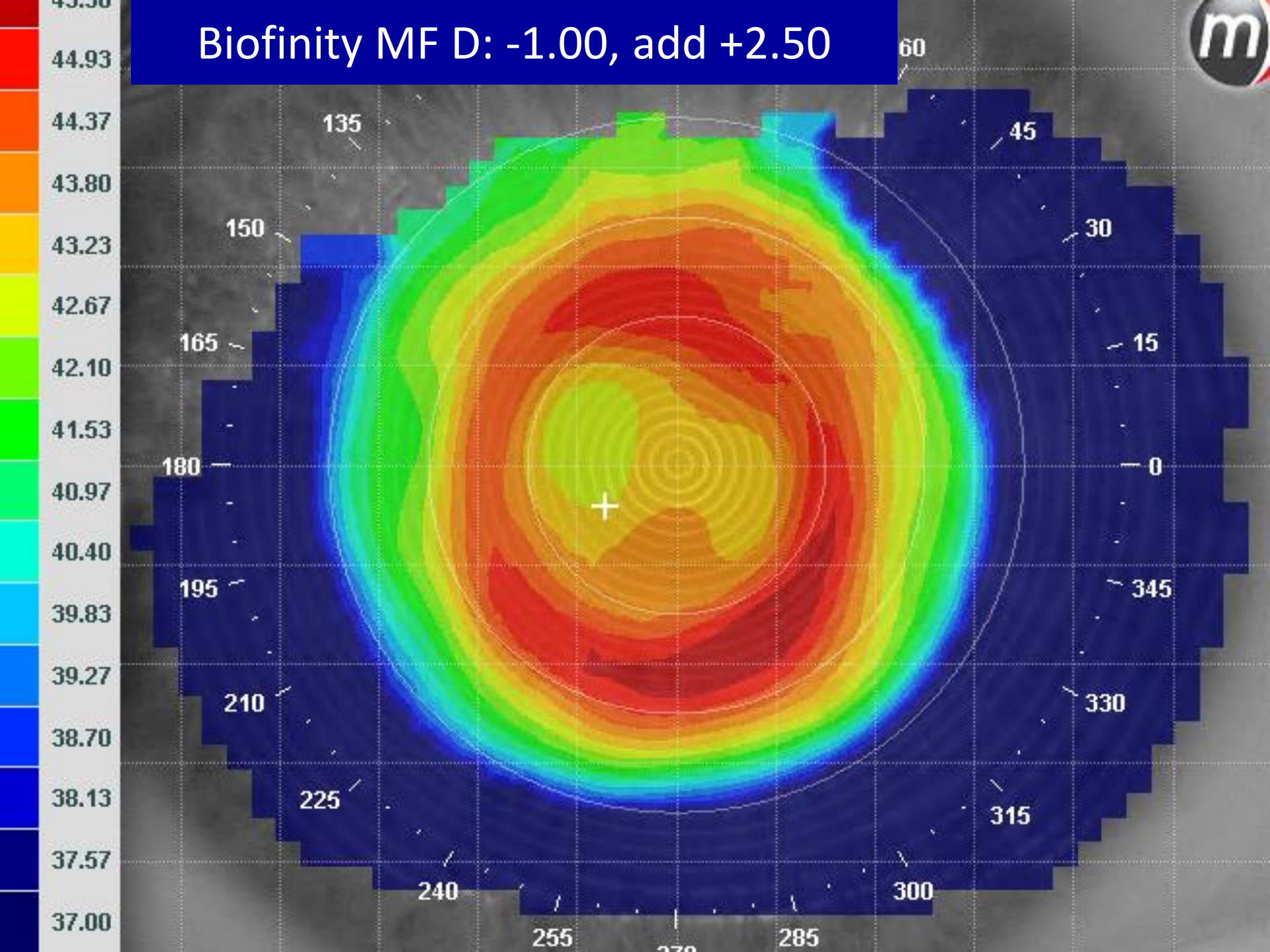
- Dosage: One drop in each eye overnight
- Source: Compounding Pharmacy eg. Optimus (Auckland)
- Advice: Sunglasses when outside, advise of any systemic side effects, review 6 monthly
- Patients will still have to wear spectacles or soft contact lenses to see clearly
- Potential to add to other myopia control options (eg orthokeratology, multifocal SCL) for summative myopia effect (Hong Kong Polytechnic is currently recruiting for a trial)

Soft multifocals

- Monthly/Fortnightly:
  - Biofinity multifocal (Distance Centre), 50% slowing of refractive myopia with +2.00 add compared to SV SCL Walline et al 2013
  - Acuvue Bifocal: >70% reduction of myopia compared to SV SCLs. Aller et al 2016.
- Daily: Coopervision Misight



Wagner et al 2014 CLAE


Biofinity MF D: -1.00, add +2.50
44.93
44.37
43.80
43.23
42.67
42.10
41.53
40.97
40.40
39.83
39.27
38.70
38.13
37.57
37.00
60
135
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15
180
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345
210
330
225
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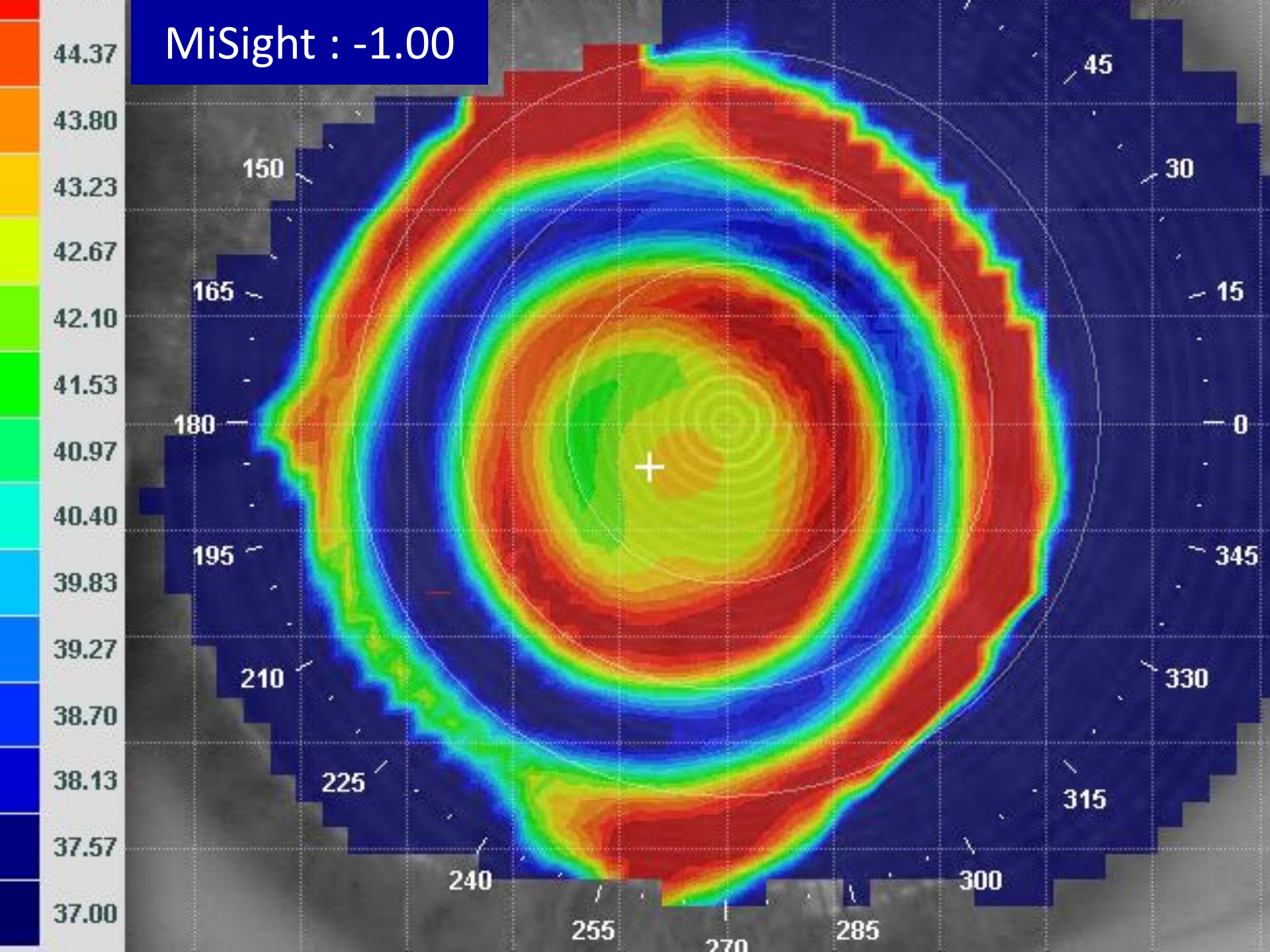
285


MiSight : -1.00
44.37
43.80
43.23
42.67
42.10
41.53
40.97
40.40
39.83
39.27
38.70
38.13
37.57
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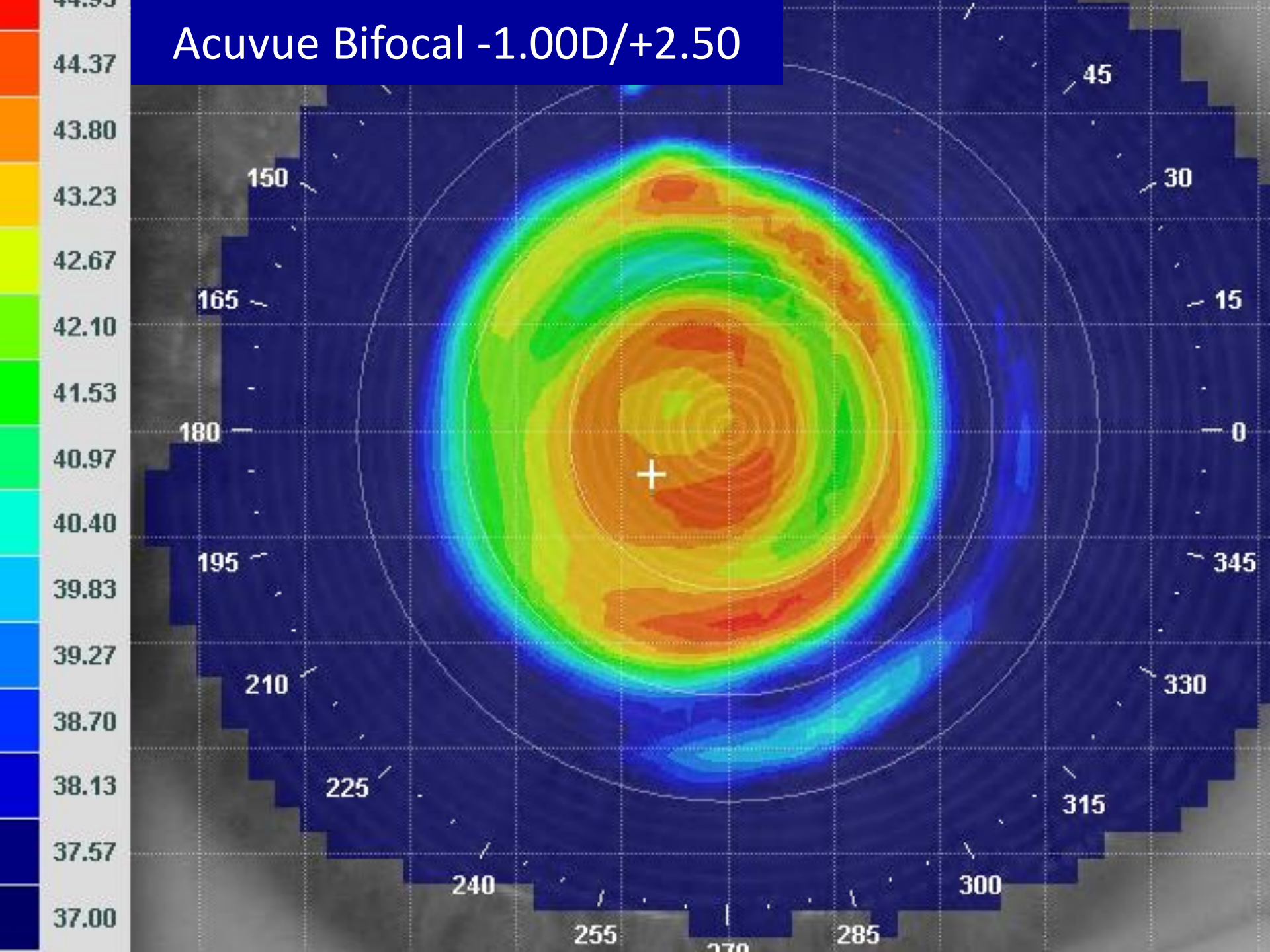
Acuvue Bifocal -1.00D/+2.50
44.37
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39.83
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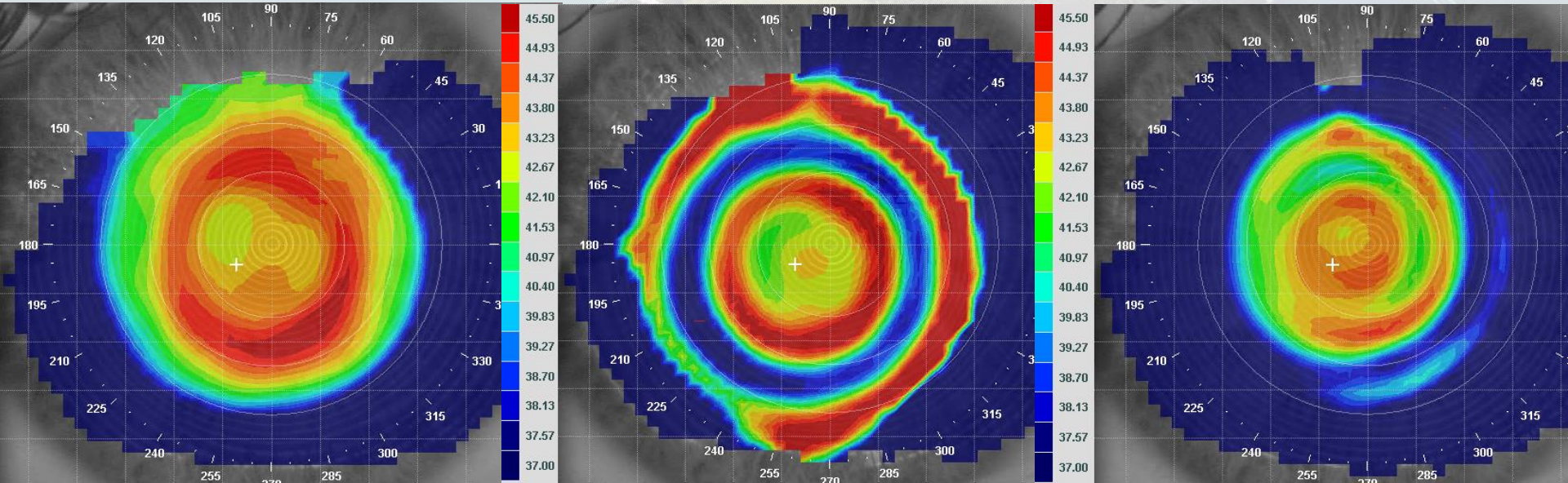
195
180
165
150

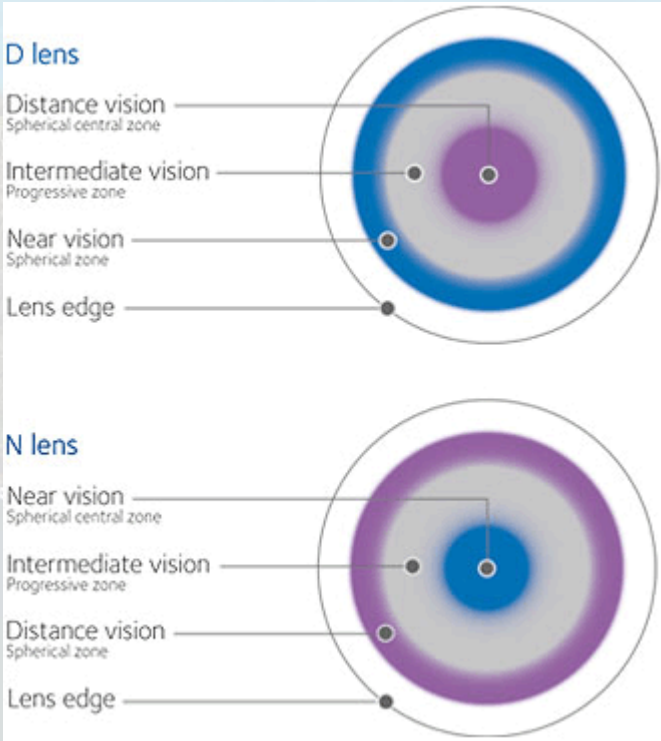
Comparison of the designs

- Tangential power difference centre to peak of mid periphery
  - Biofinity MF D: 2.50D
  - Misight: 2.30D
  - Acuvue Bifocal: 1.10D (likely topographer error given crowded zones)
- Width of the zones



Soft multifocals in practice

- Higher add theoretically provides greatest level of peripheral myopic retinal defocus.
- BLINK Study: +2.00 add powers do not provide any subjective or objective differences in vision compared with SV CLs. Adds +3.00 and above however did in some areas. Bickle 2013
- PREP Survey: Children changed from habitual spectacles into SV SCL and MF SCL (Proclear MF D +2.00 add). Comparable improvement in quality of life. Greiner 2009



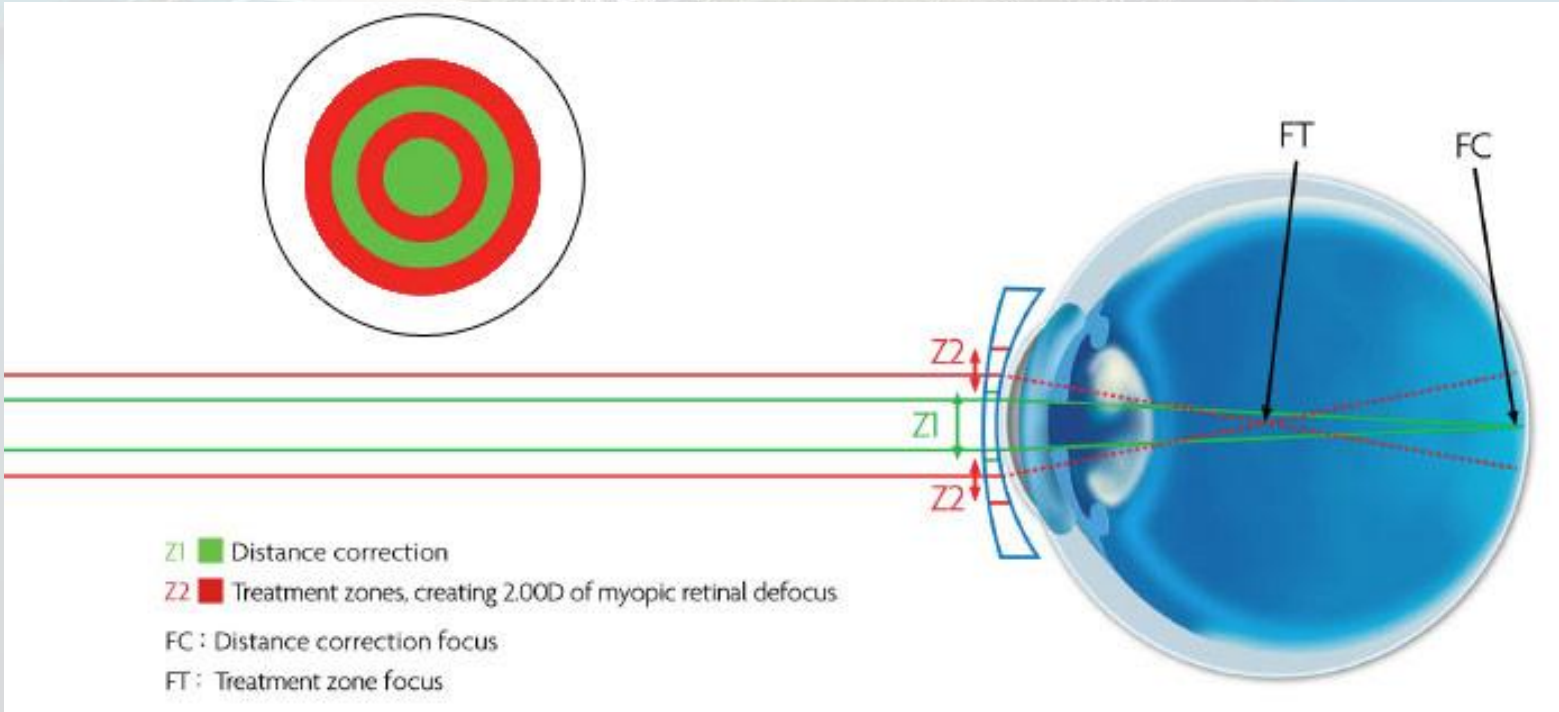
Soft multifocals in practice

- Start with +2.50 add to maximise myopia control and not compromise vision.
- BLINK Study: Most children require an extra -0.50D for best vision with a 2.50 add.
- Only decrease the add if vision is below 6/7.5 and the child is complaining of poor vision Walline 2017
- *Potentially a good option compared to an adult orthokeratology design in low myopes around -1.00D*

Coopervision

MiSight™
ActivControl™ Technology

- Homegrown (University of Auckland).
- The only commercially available contact lens designed for myopia control.
- Daily. Proclear 1 Day material.



Coopervision

MiSight™
ActivControl™ Technology

- Interim 2 year results from the Coopervision clincal trial were presented at AAO meeting in December 2016:
- 59% slowing of myopia vs SV SCL as measured by cycloplegic refraction.
- 53% as measured by axial length.
- 84% of parents were ‘extremely at ease’ with their children using contact lenses after 2 years of wear.

Soft multifocals in practice

- Retrospective analysis of 110 patients at the University of Auckland myopic control clinic between 2010-14. Turnbull 2016
- 56 using Ortho-K, 32 using dual-focus soft contacts. Mean follow-up 1.3 years.
- 92% slowing for Ortho-k and 91% for dual-focus soft lenses.
- *"No significant difference in the efficacy of the two methods.. Very few barriers for any contact lens practitioner to be actively promoting myopia control treatment to at-risk patients."*

THE UNIVERSITY OF AUCKLAND
NEW ZEALAND

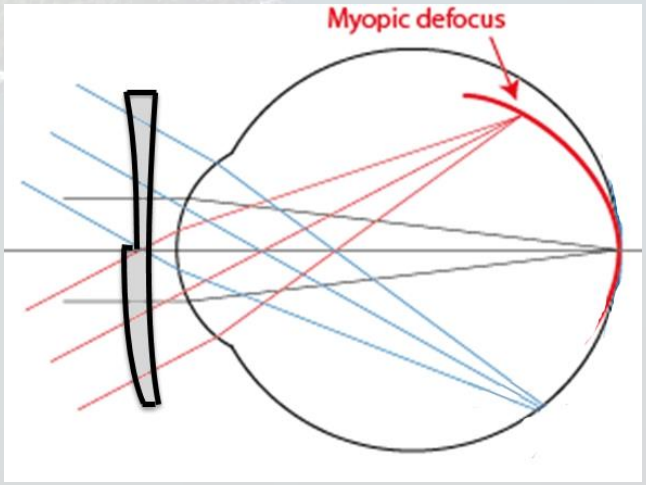
Bifocal/PAL spectacle lenses

The jury is still out!

- Hong Kong Progressive Lens Myopia Control Study 2002: No statistically significant difference in progression over 2 years between PAL and SV.
- 17% difference (significant) for PALs versus SV over 2 years. Yang et al 2009
- COMET study showed progressives had a greater myopia control effect on children with high accommodative lag and esophoria. Gwiazda et al 2004
- 34% less axial growth compared to SV for executive bifocals (+1.50 add) after 2 years. Greater difference when measuring refraction. Cheng et al 2010

Bifocal/PAL in practice

- Measure accommodative lag and phoria status
- Add level:
  - +1.50 is a good place to start (ok for computer distances)
  - Neutralise esophoria
  - Use accommodative facility
- Executive bifocal, fitted at or just below pupil.



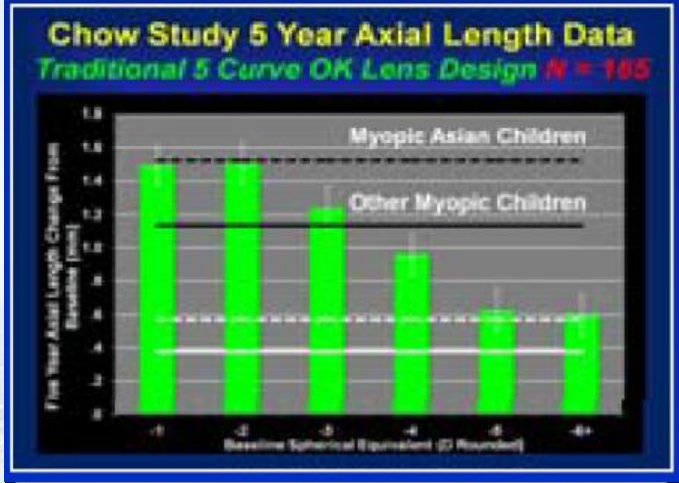
Myopia Control in General Practice

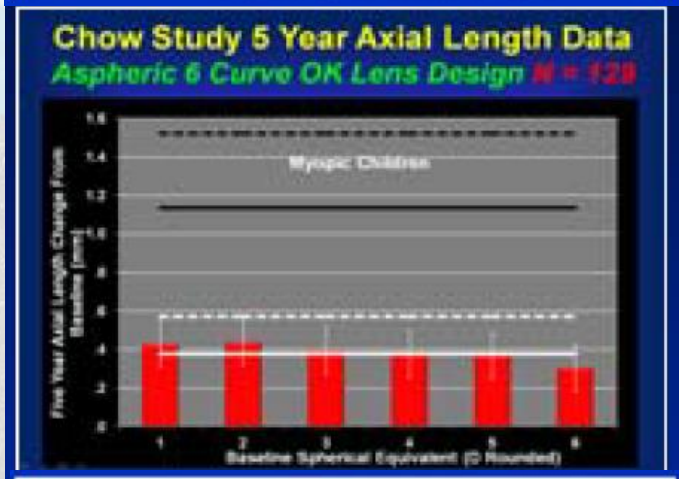
Summary

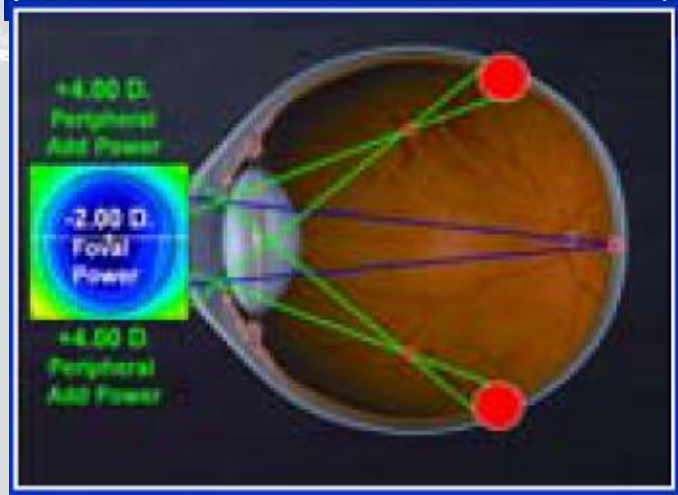
- Atropine or multifocal soft contact lenses are the most effective options for a practice without orthokeratology.
- PALs, bifocals are better than SV lenses, especially in near esophoria and accommodative lag.
- Encourage outdoor time especially in at risk children (myopic parents, myopic shift, low hyperopia <0.75D age 6-7)
- Consider referral to a myopia control specialist if they can also offer orthokeratology, measure axial length, access Misight daily contact lenses etc

A quick note on Ortho-K for myopia control

- The newest myopia control ortho-K designs use smaller optic zones and aspheric base-curves. This can create a larger and more positive mid-peripheral corneal steepening than ‘adult’ orthokeratology designs.
- This theoretically creates a larger myopic blur circle on the retina.. Leading to better myopia control.







Myopia Control in General Practice:

Take home message

- **Offer some form of myopia control option to every progressing myope.**

Slowing myopia by 50% in all myopes will reduce myopia over 5D by **97%**

(mathematical model based on Australian data – Fabian Conrad presentation 2016)

Thanks!

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