Designing and Fitting Scleral Lenses With High Resolution Optical Coherence Tomography

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Leaving the cornea is sometimes necessary

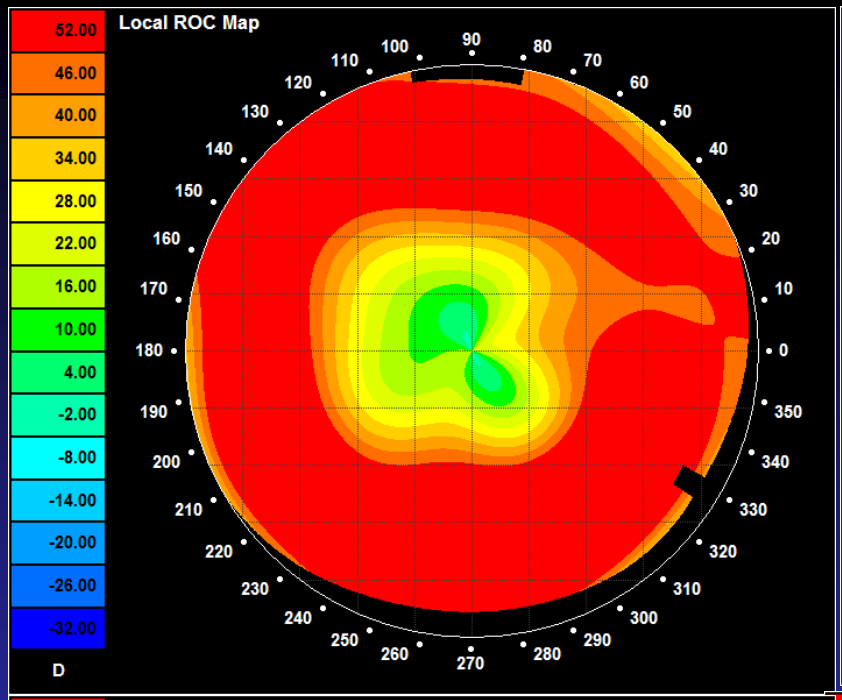
Why Sclerals?

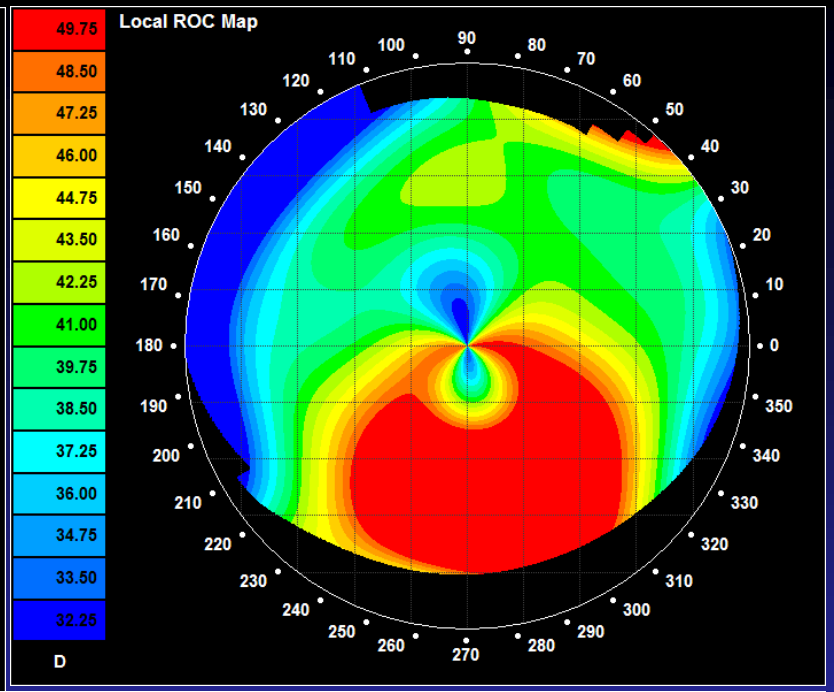
- Scleral lenses are comfortable.
- Scleral lenses can be adapted for a wide range of conditions
  - Dry eye
  - High astigmatism
  - Scarred and diseased corneas
  - Keratoconus
  - Post-surgical

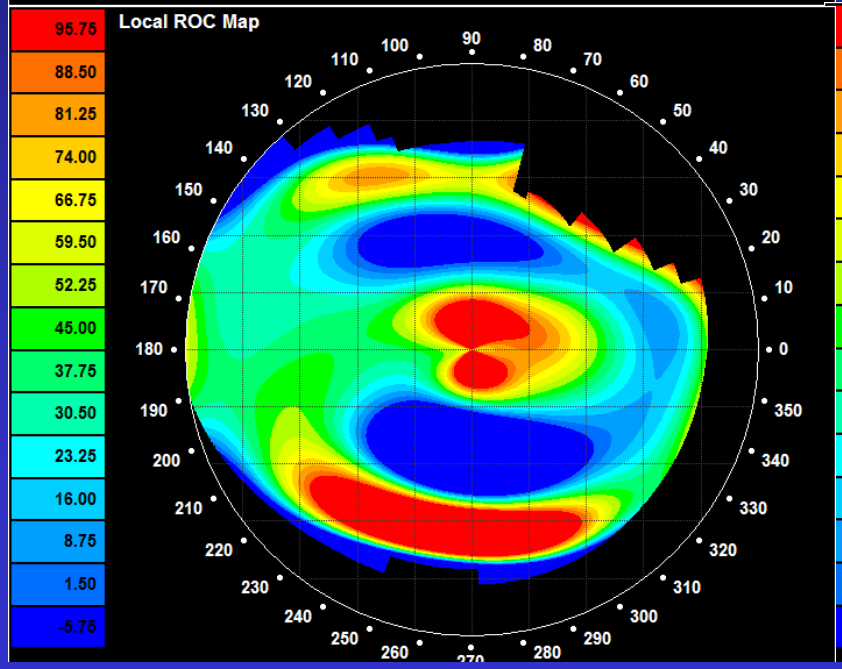
Why Sclerals?

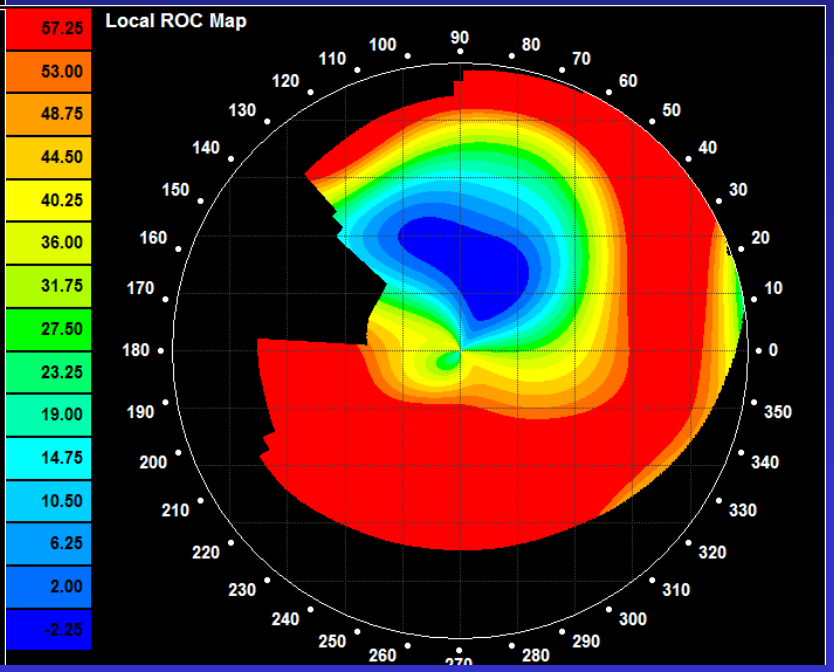
- They don’t translate.
- They stay centered
  - Ideal vehicle for complex optical corrections such as wavefront optics.
  - Bifocal corrections
- They are ~~easy~~ to fit.

What do we know about the sclera?

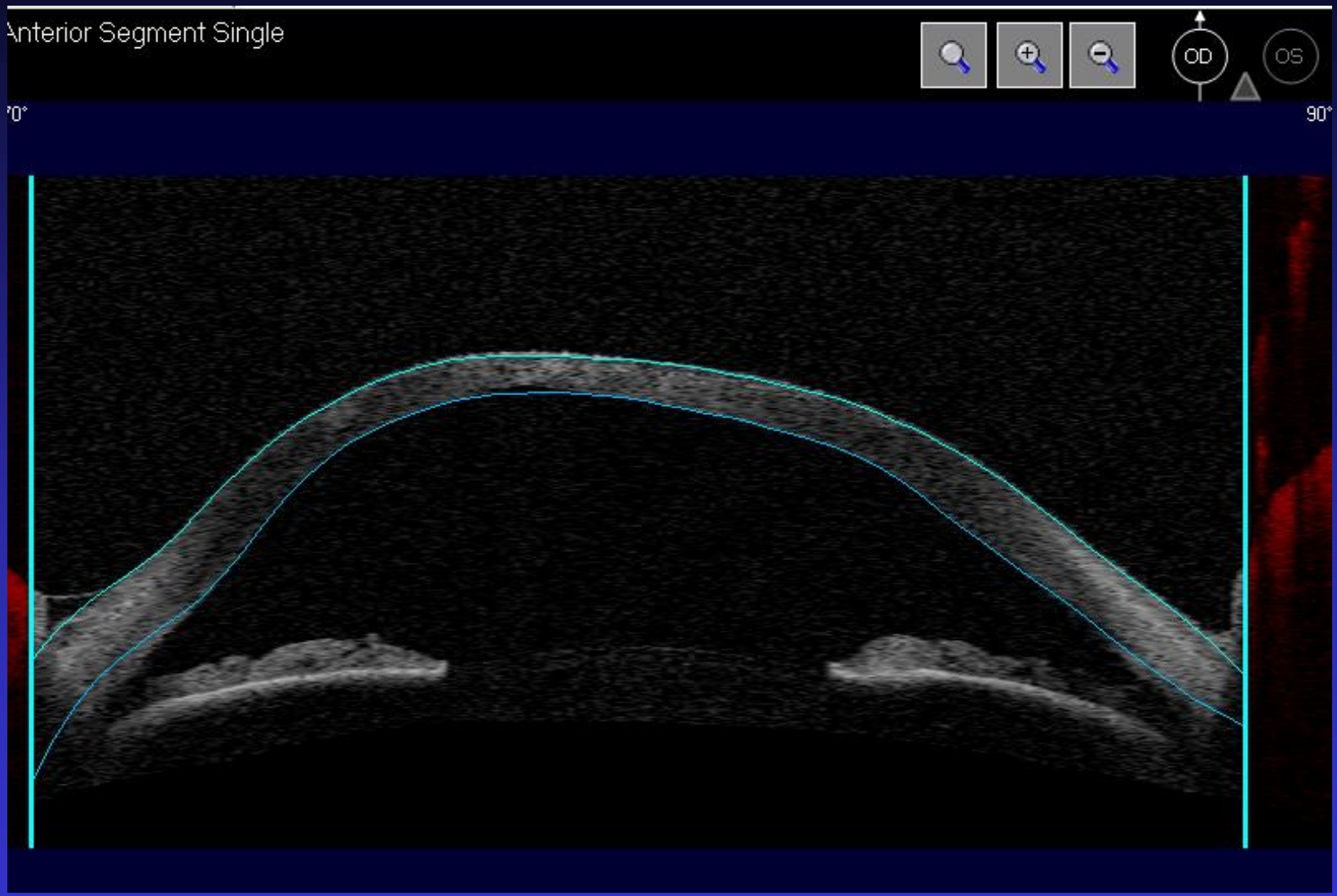








Trial Lenses



Visante OCT

A novel method of fitting scleral lenses using high resolution optical coherence tomography. Gemoules G. Eye & Contact Lens. 2008 Mar;34(2):80-3

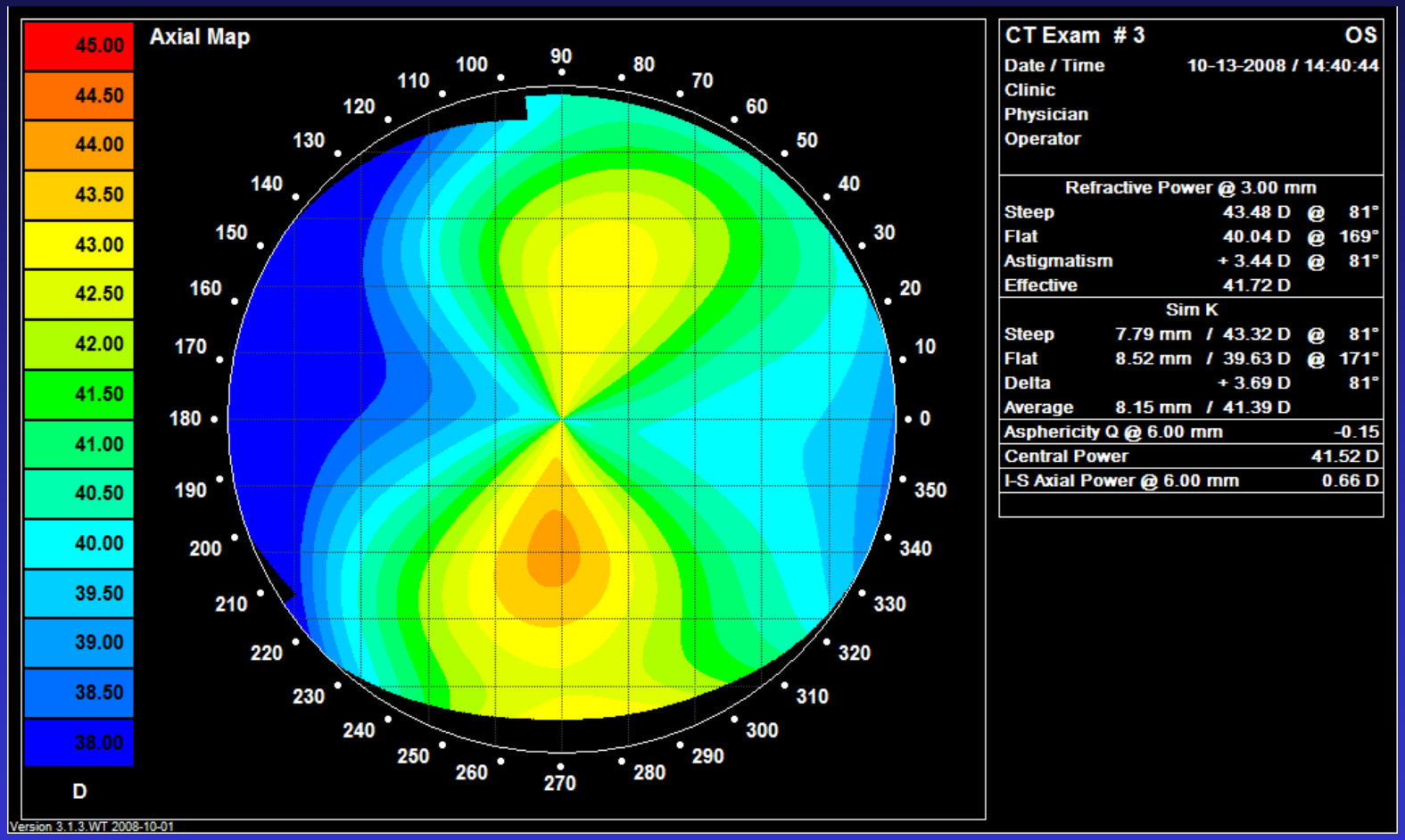
- 9 patients
- Average of 1.7 lenses/eye
- Fewer lenses than trial lens method

Advantages of OCT

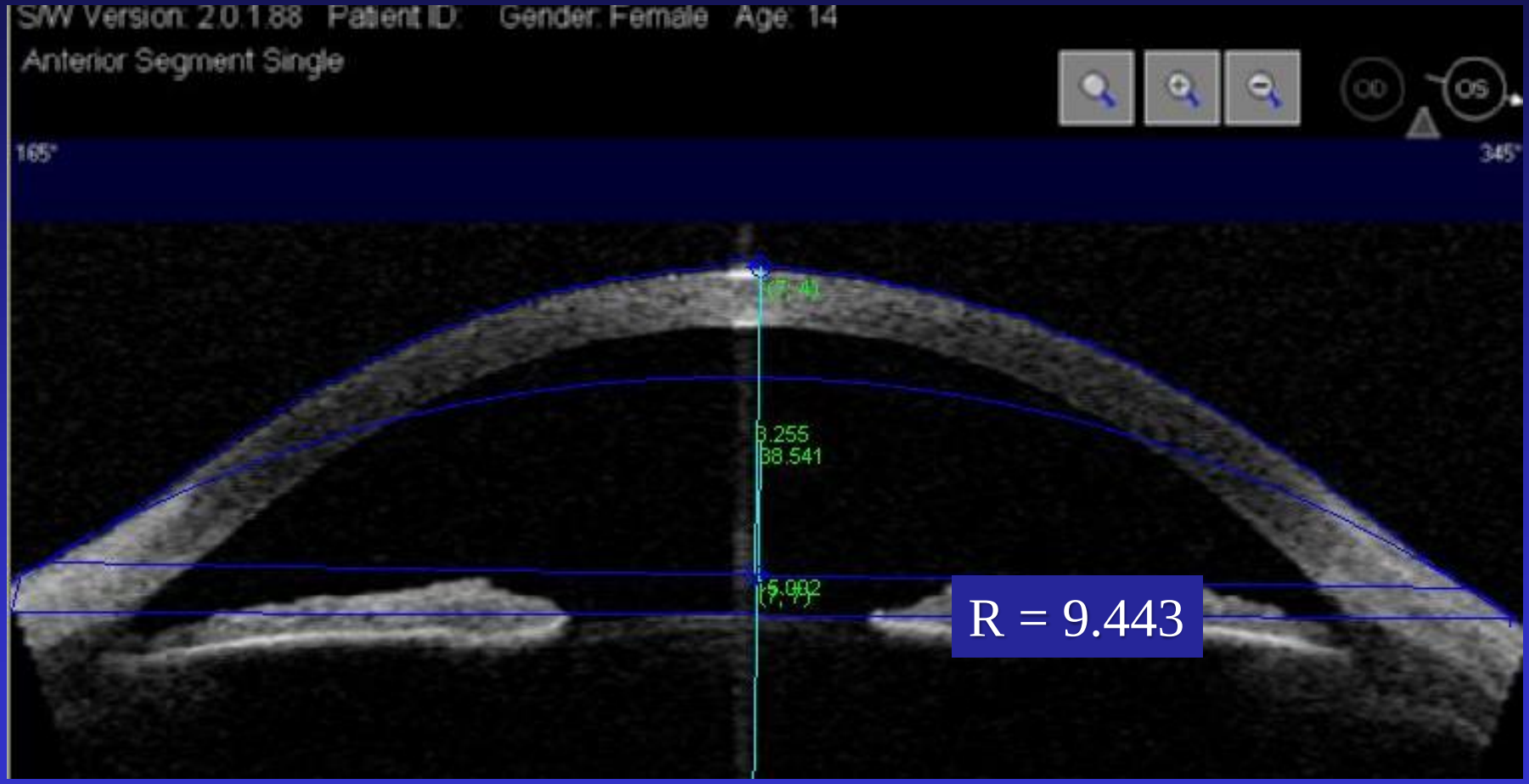
- OCT images are intuitive.
- True elevation data from any reference plane.
- Diagnostic capability
  - Lens/cornea relationship
  - Lens/sclera relationship
- Can actually measure the sclera
- Assists in determining proper lens diameter and shape based upon the individual eye.

Getting Started

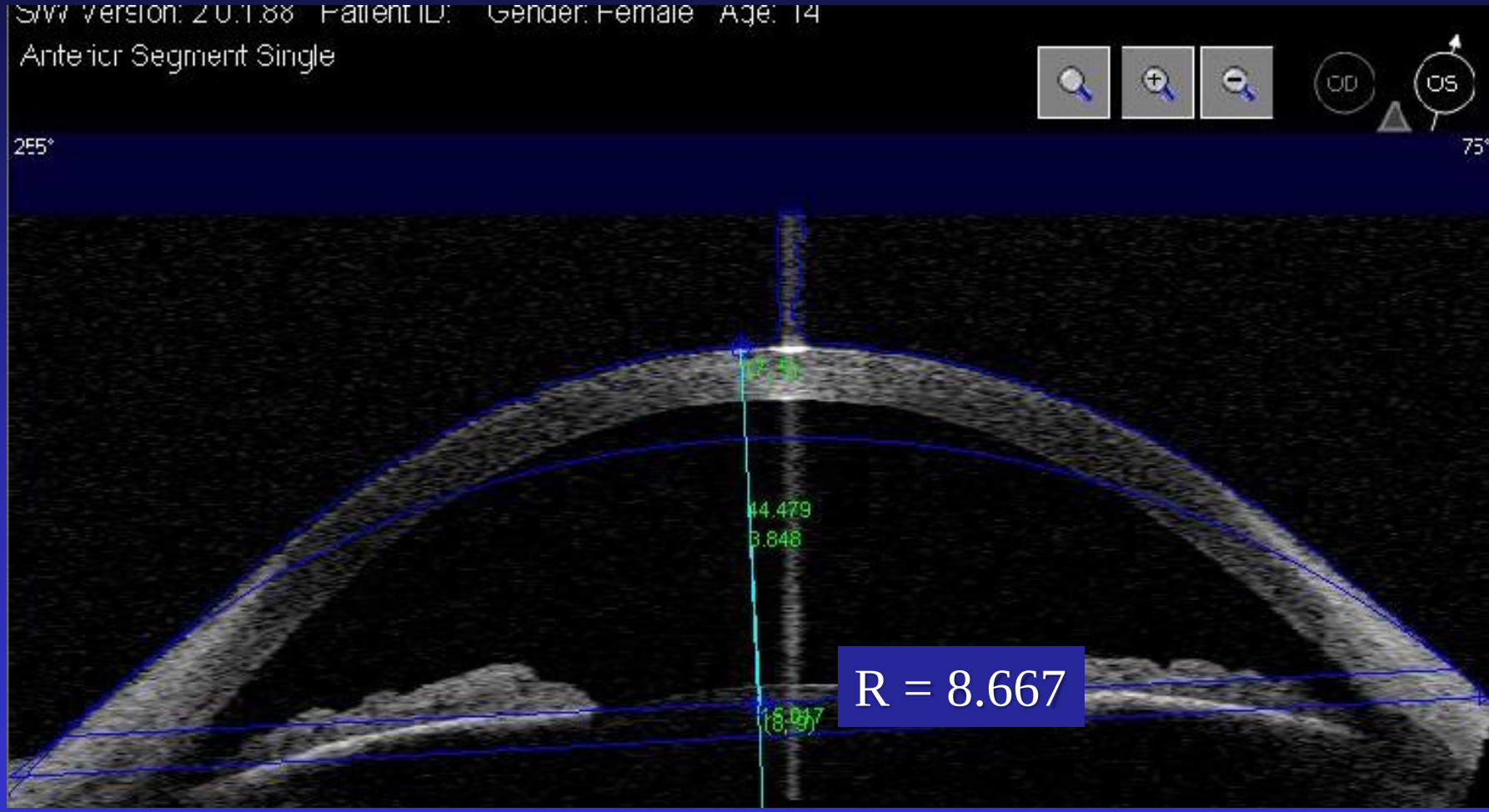
Topography as a guide



Cornea scanned at 165 deg.



Cornea scanned at 75 deg.

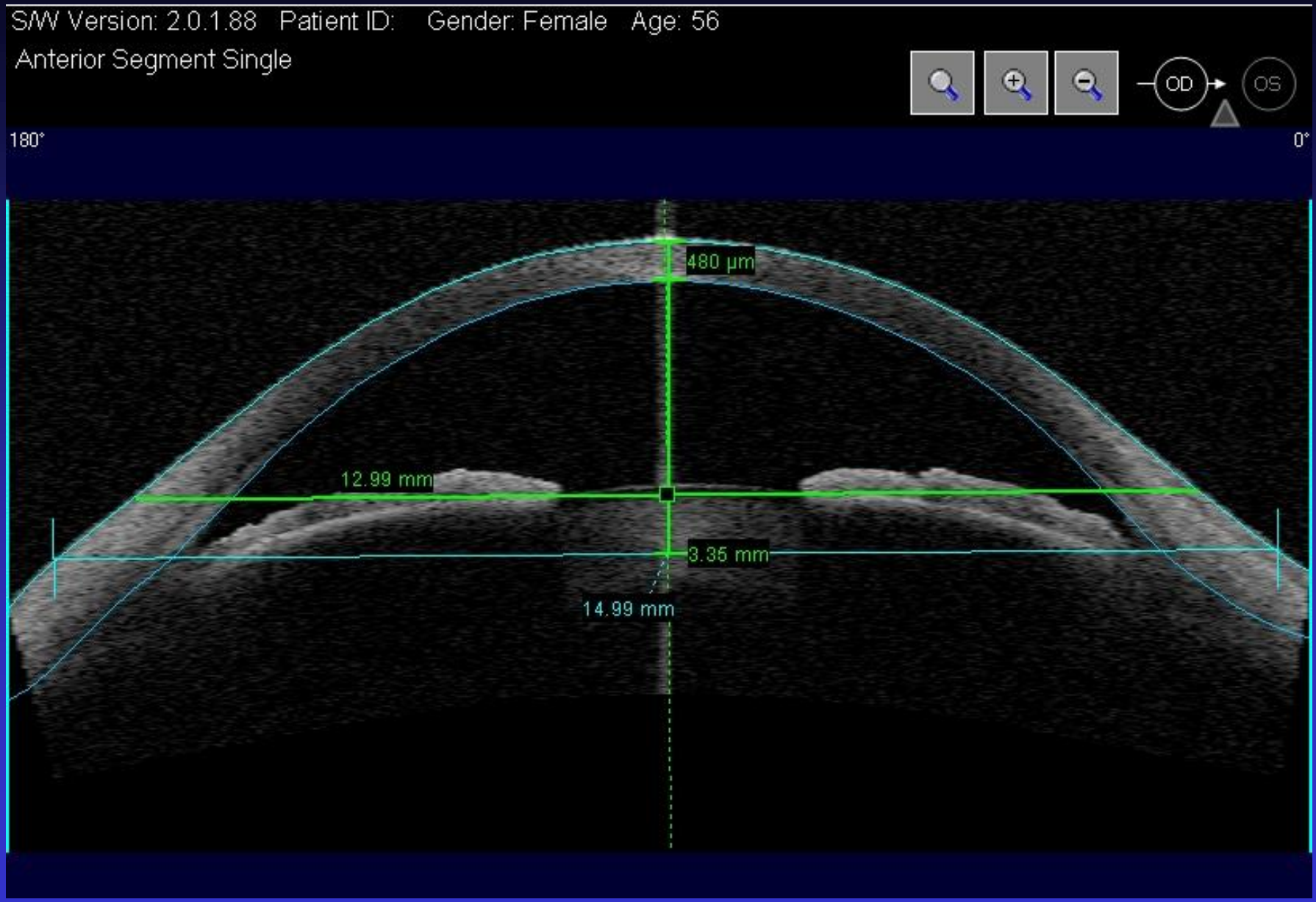


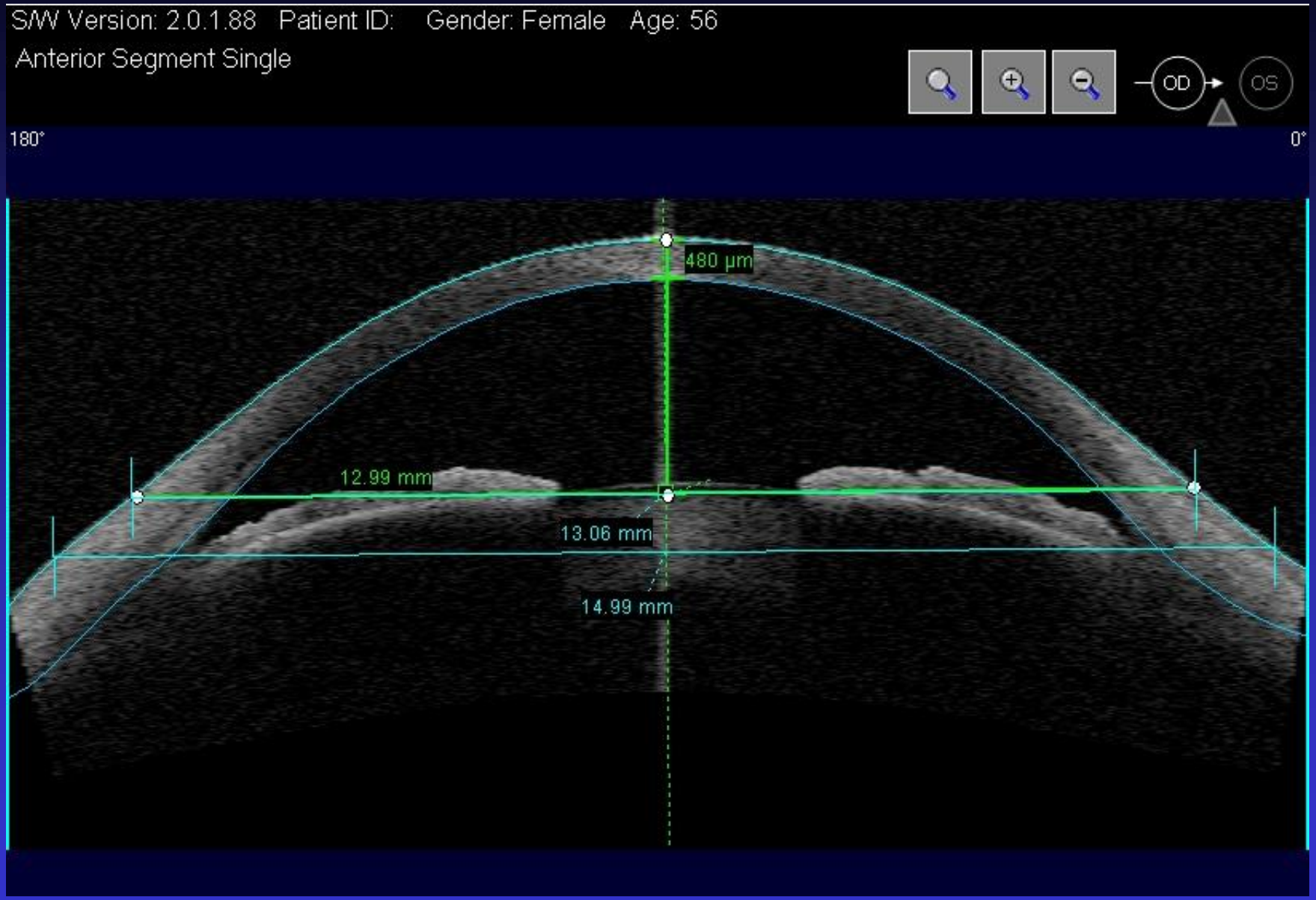
Data And Design

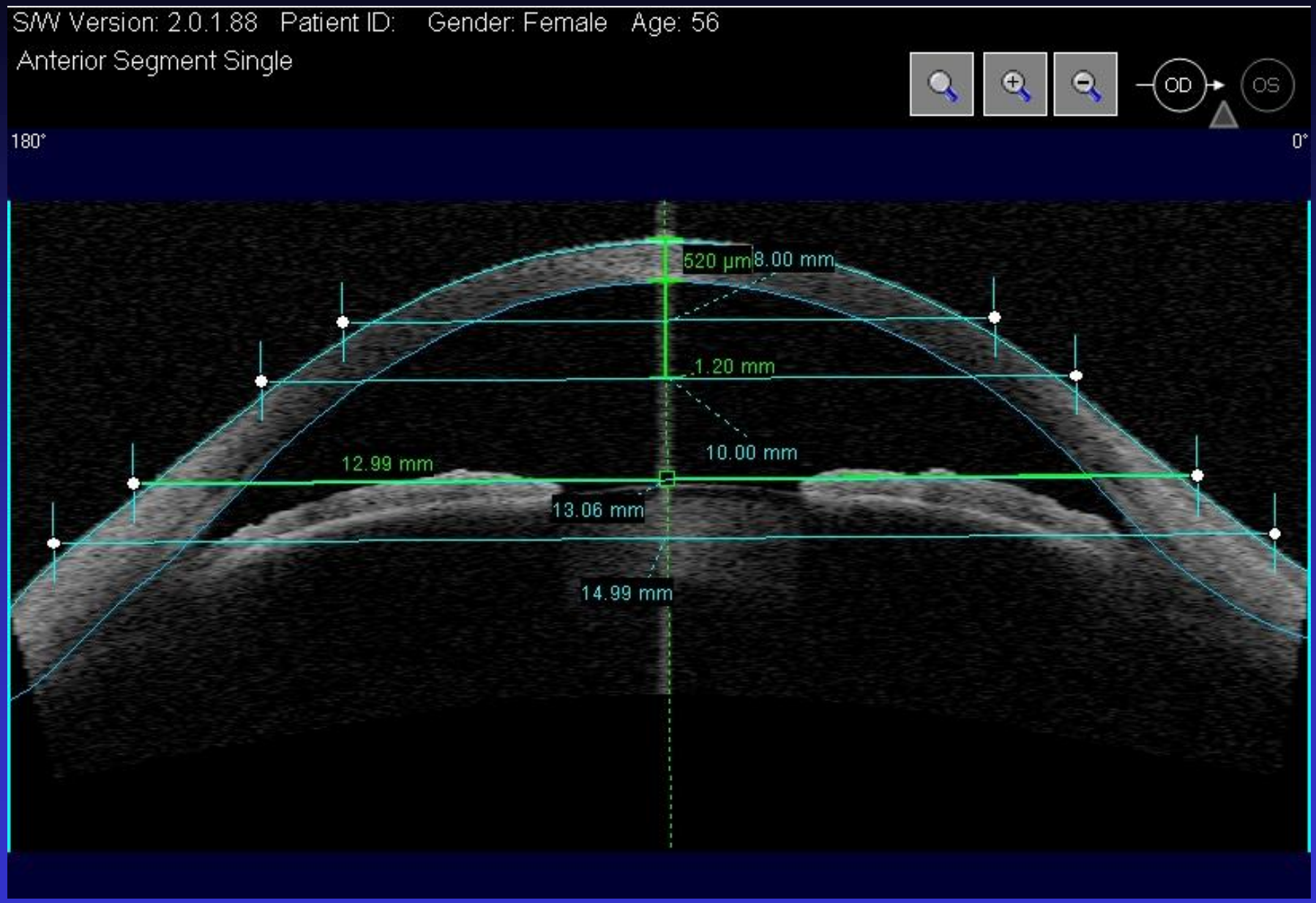
Sags, Chords, and Conoids

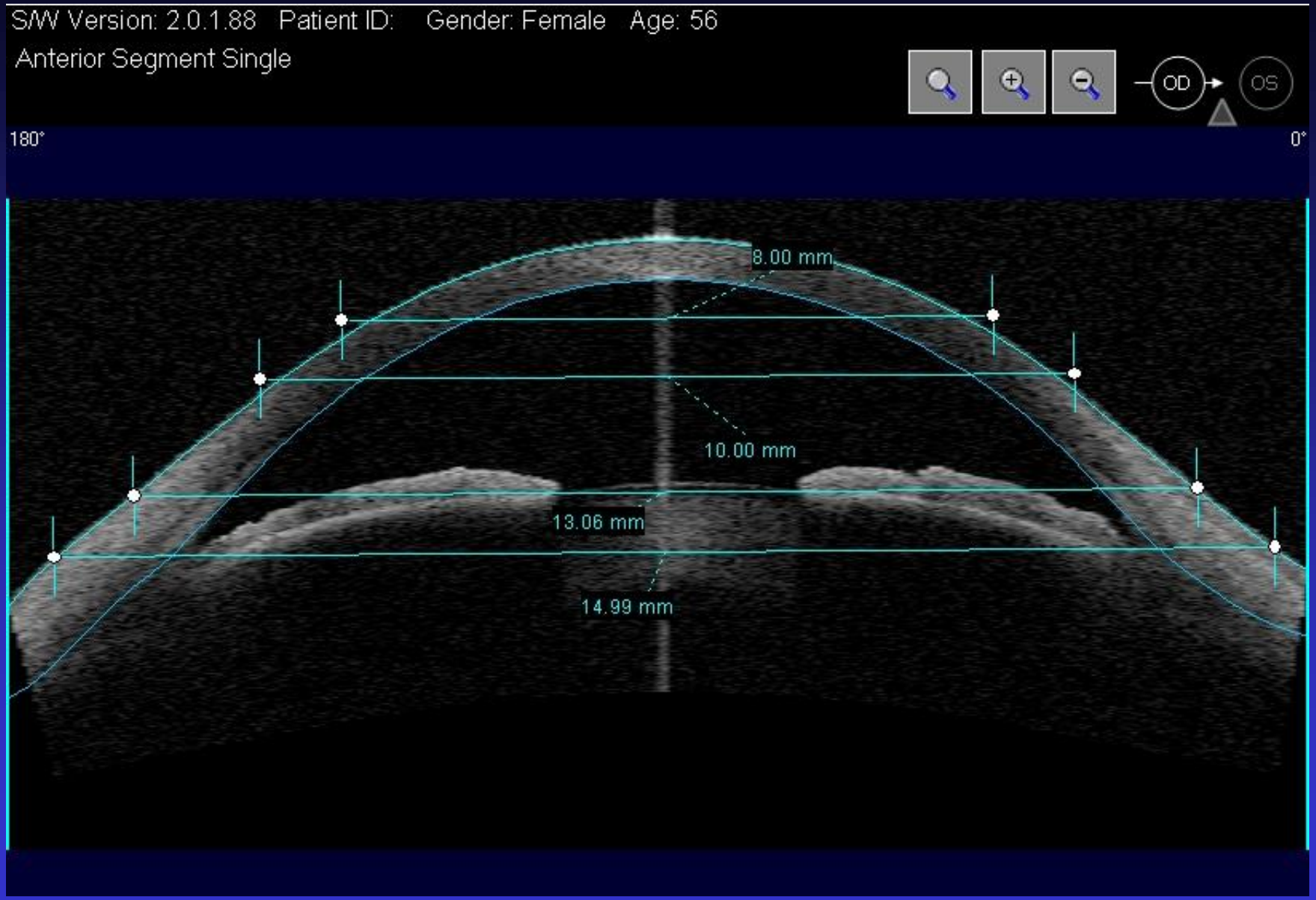
$$r = (y^2 + px^2)/2x$$

r = radius of curvature
y = chord/2
p = eccentricity
x = sagitta

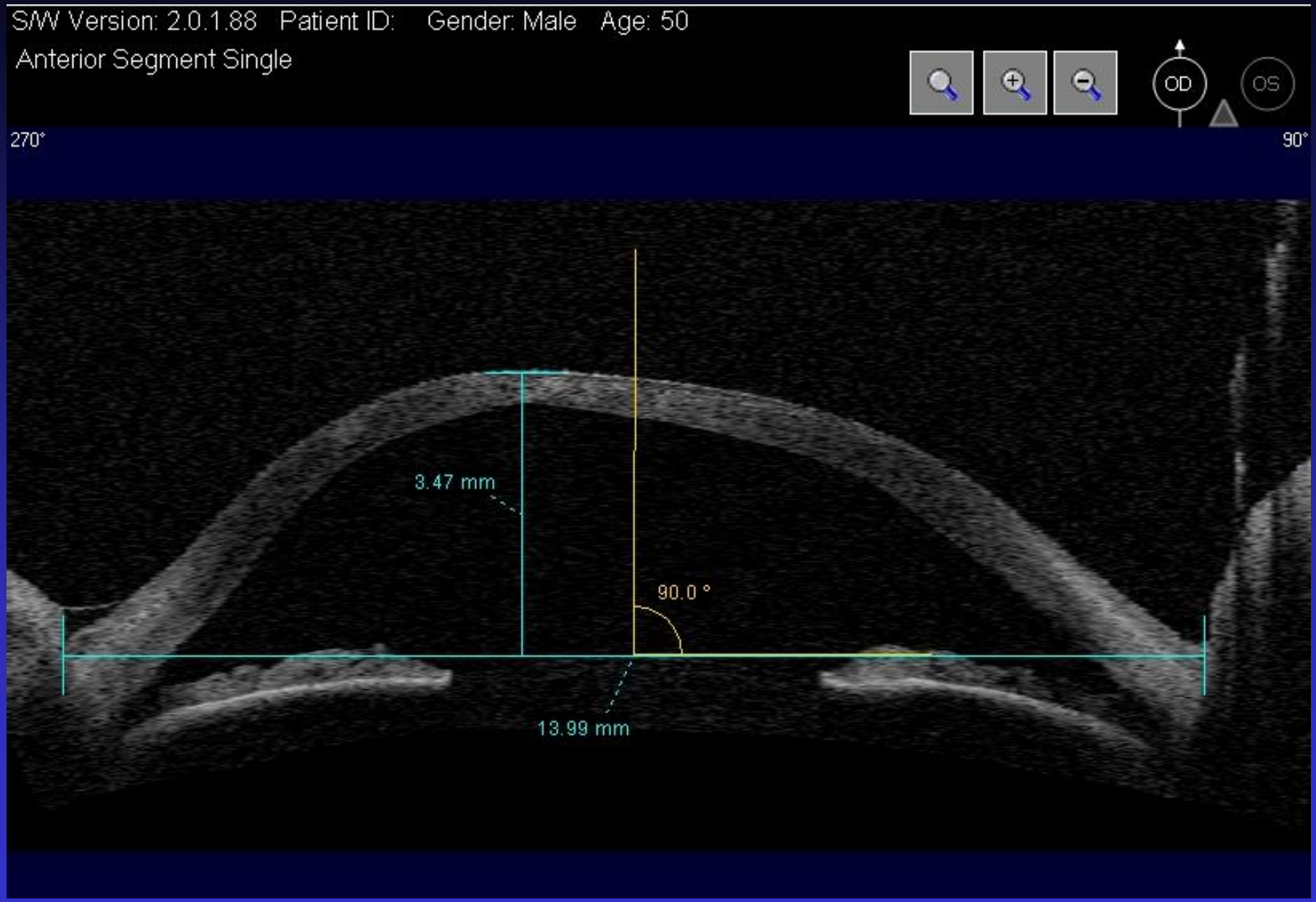


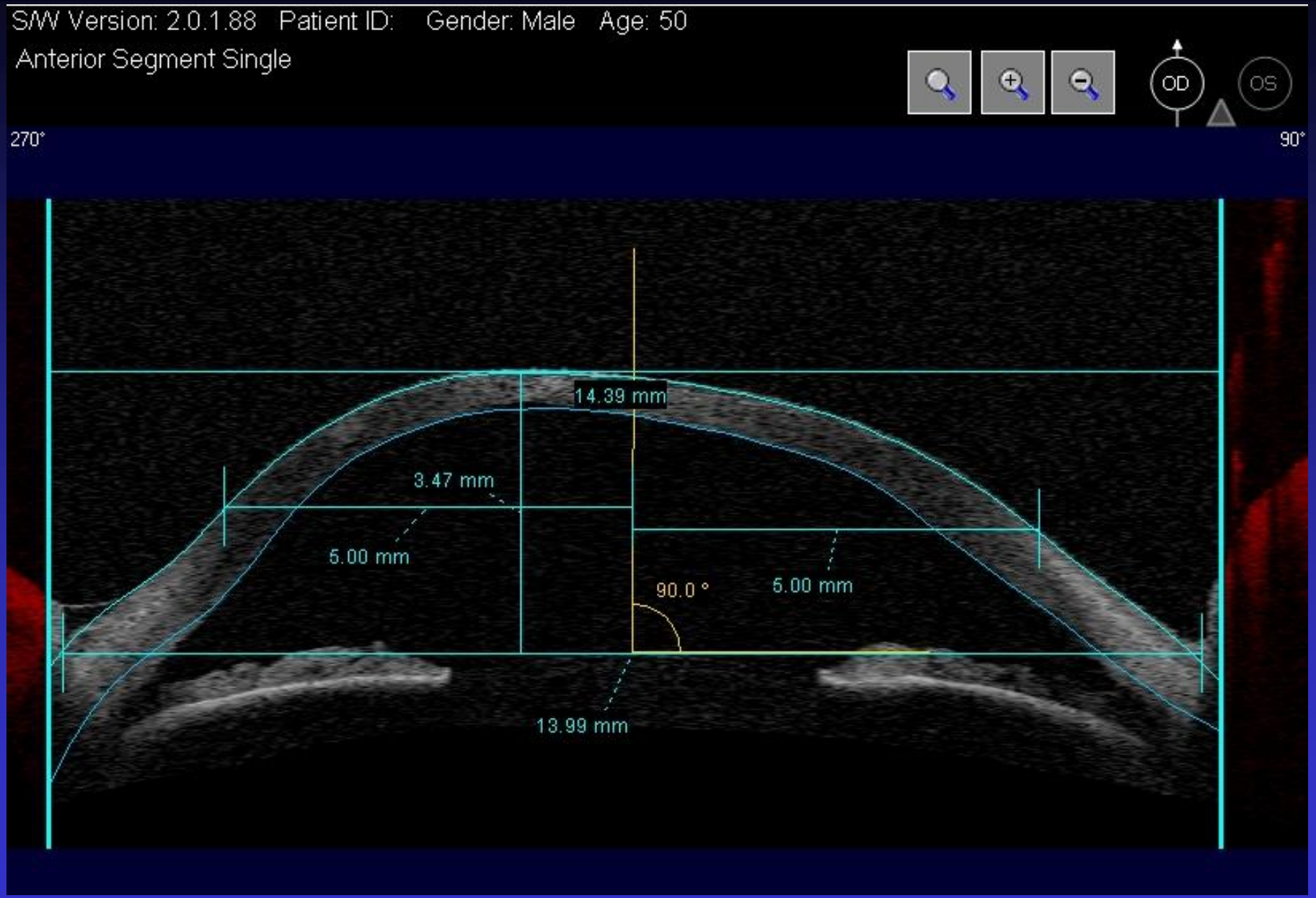




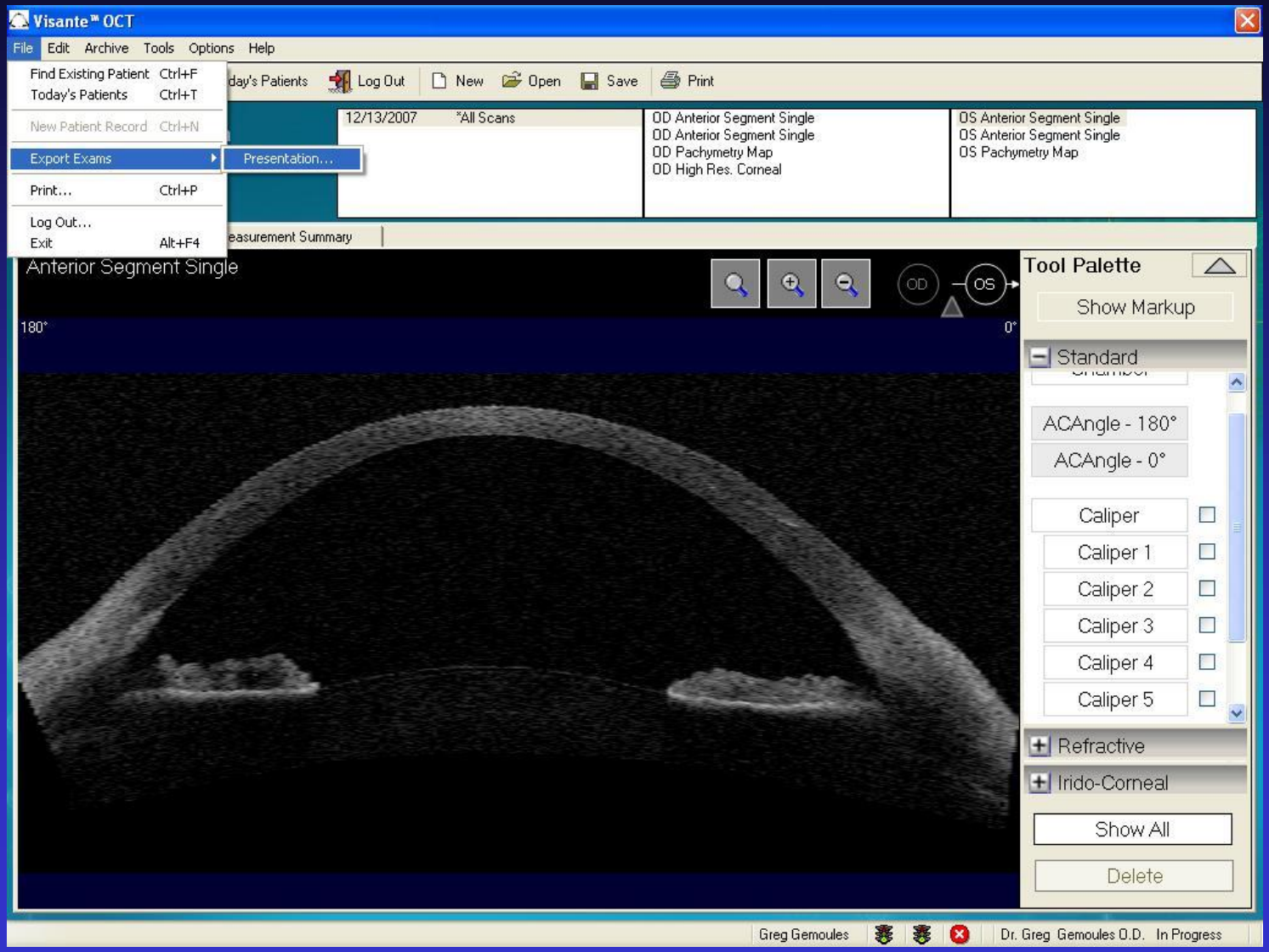


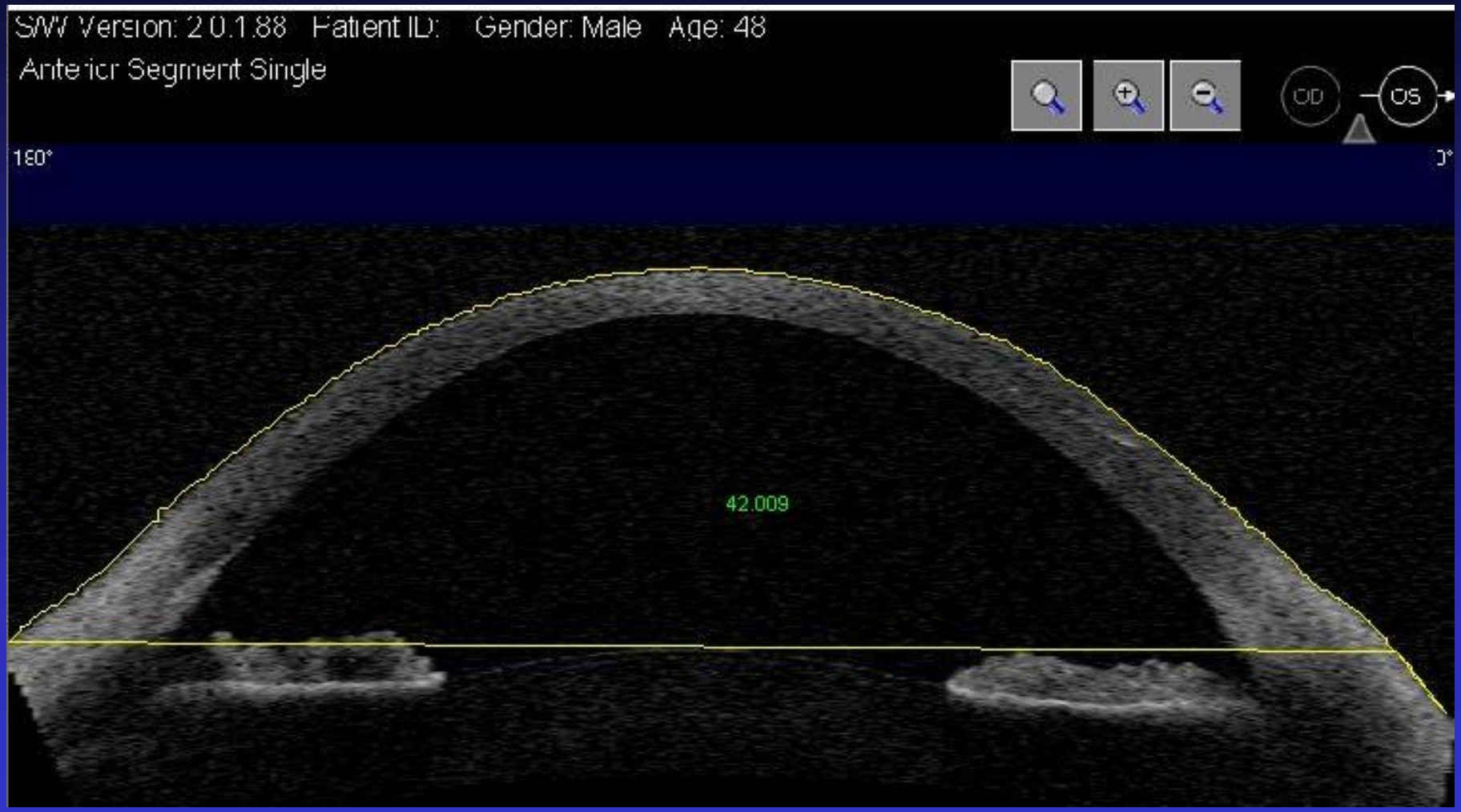
NOW THAT WAS EASY!

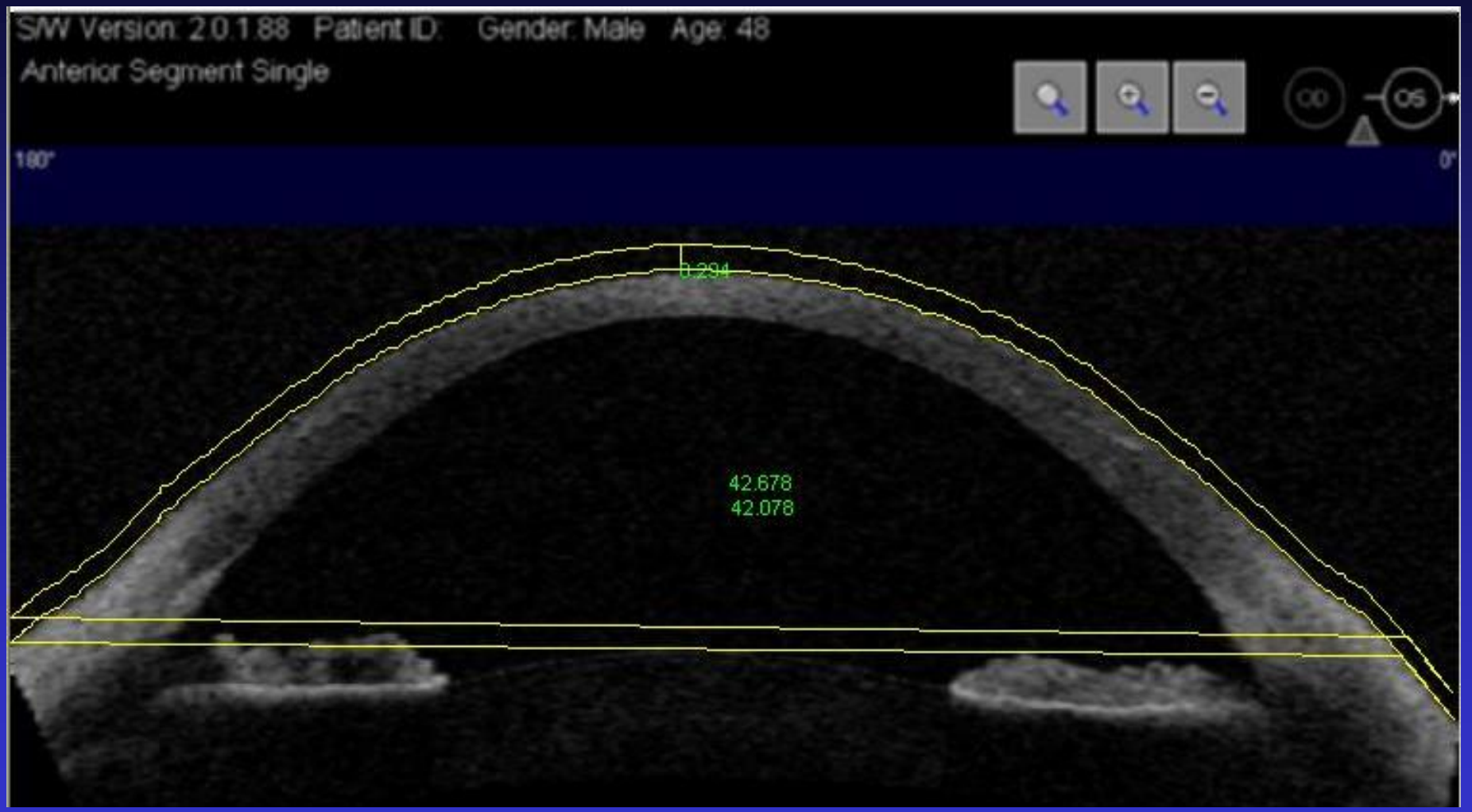


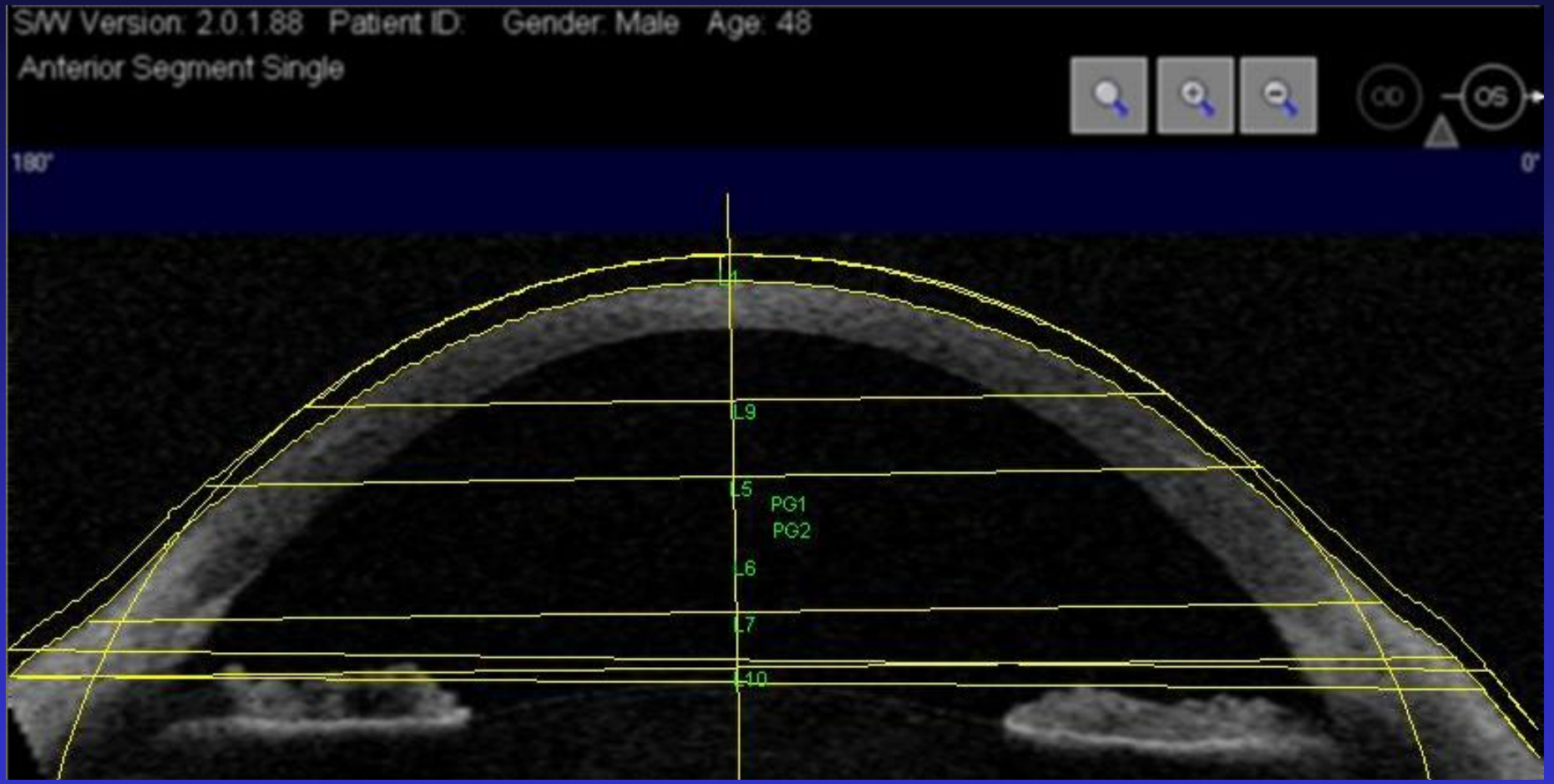


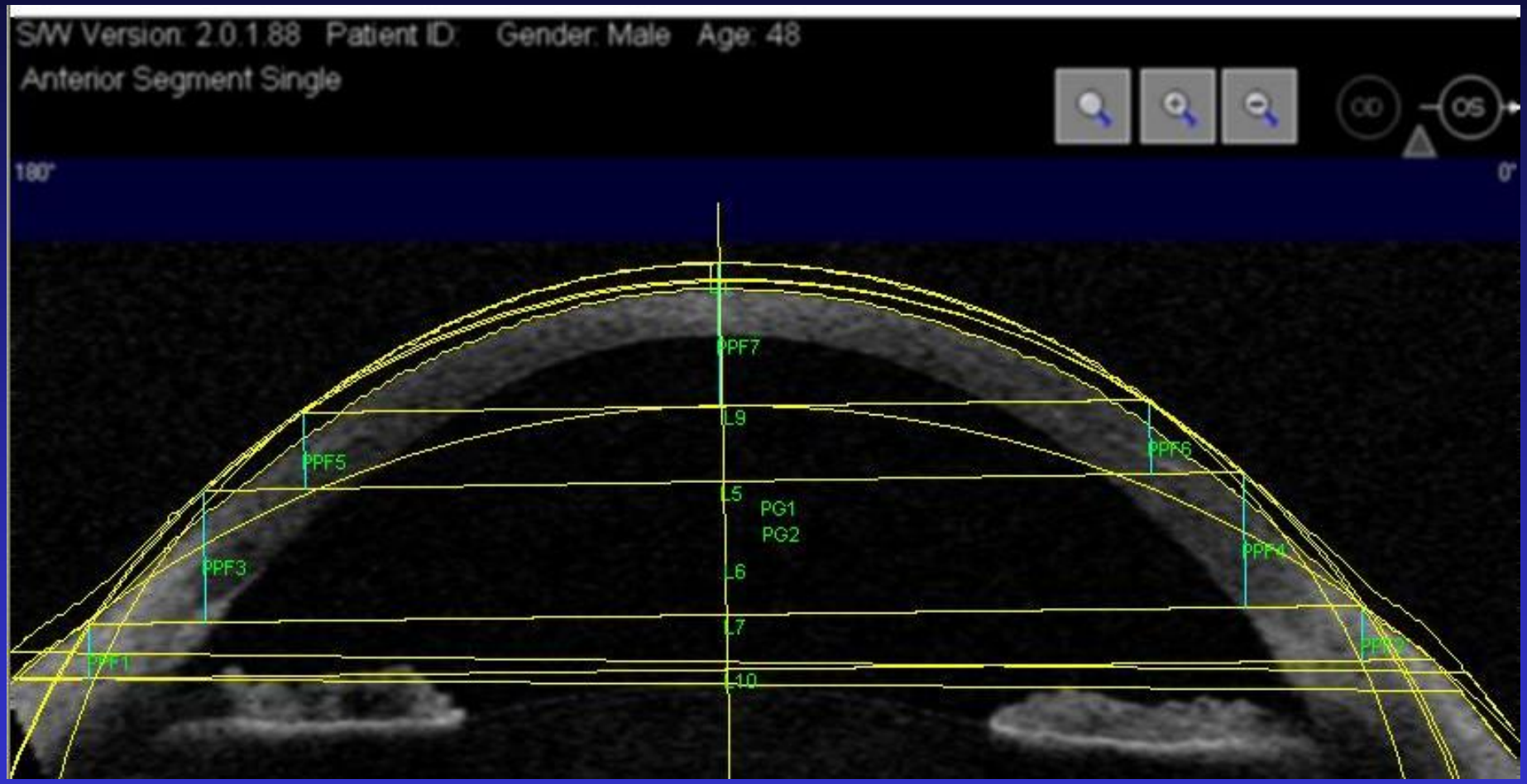
Exporting Images

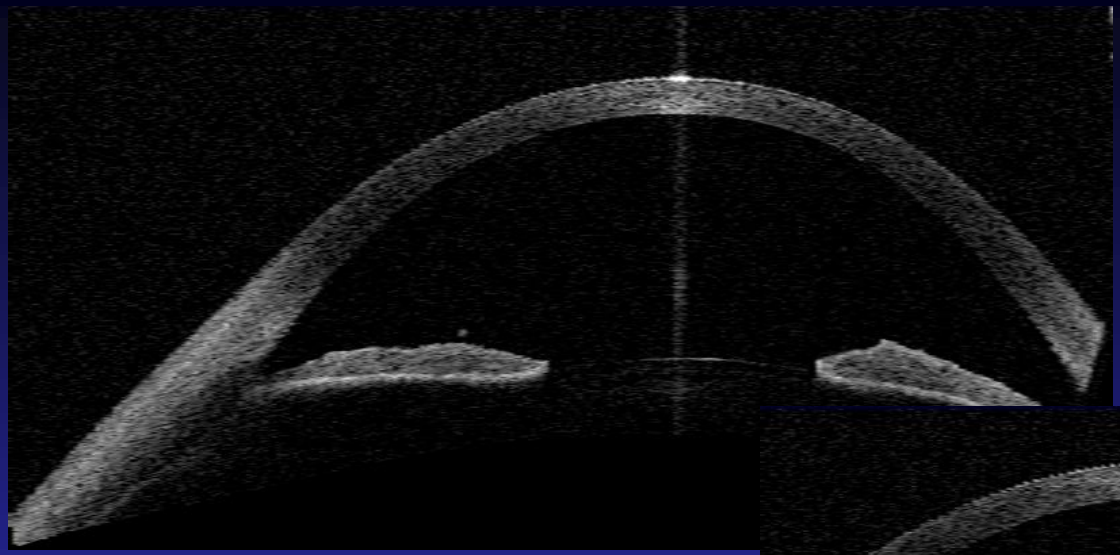




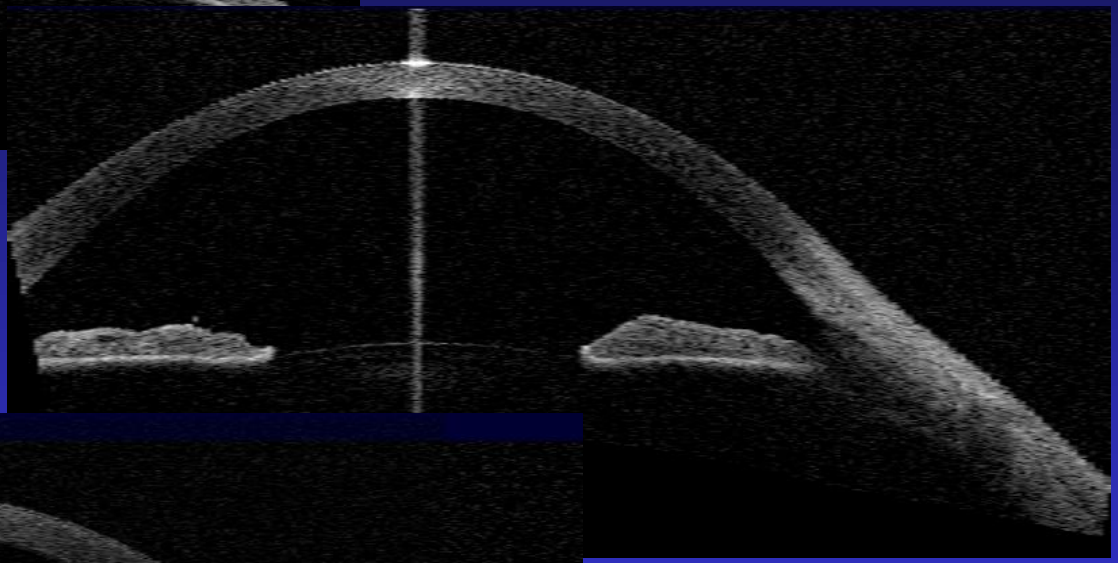




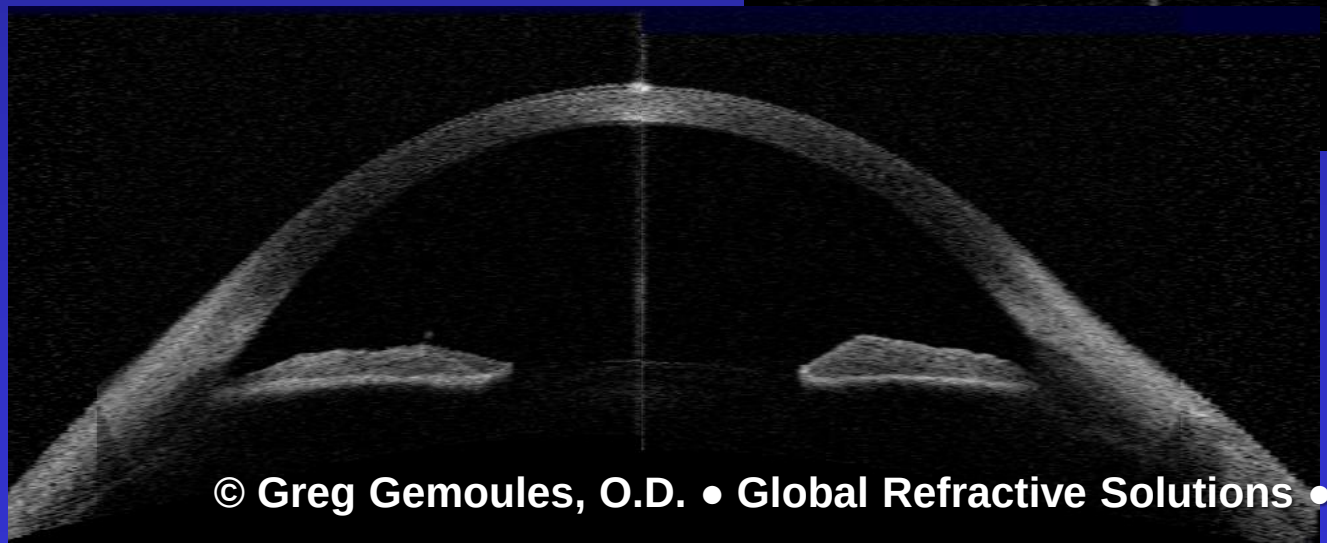




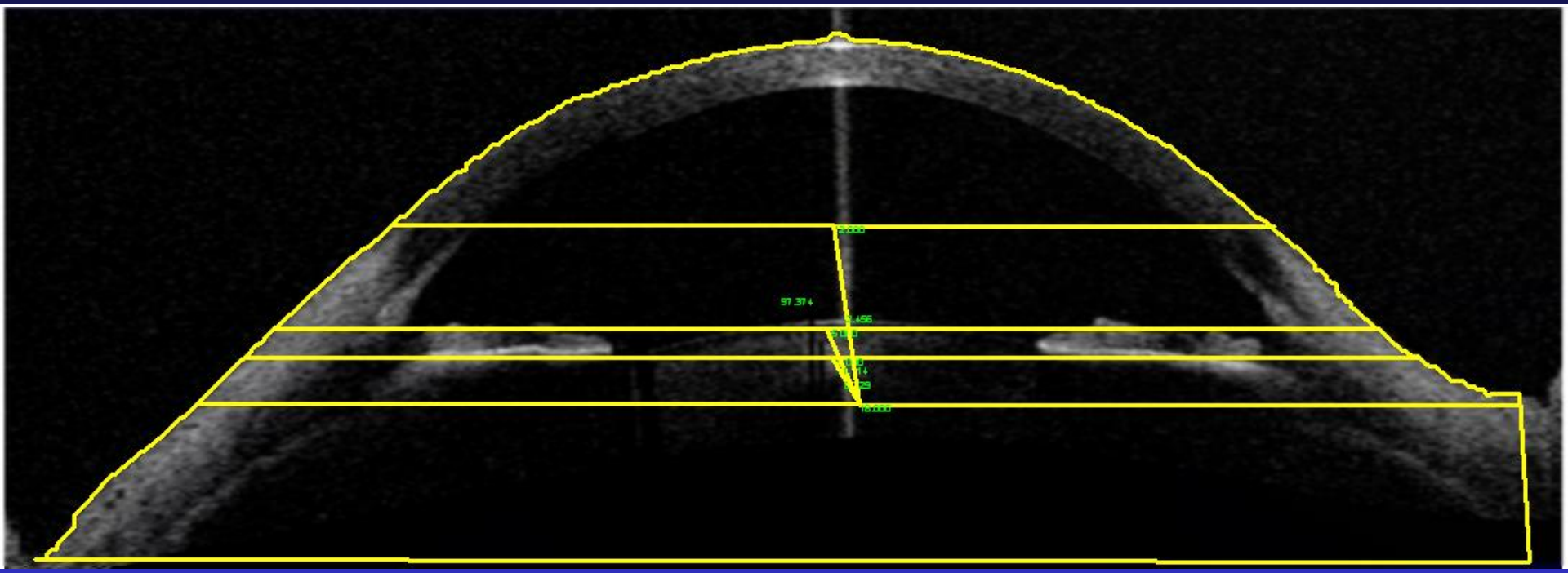
Temporal Scan

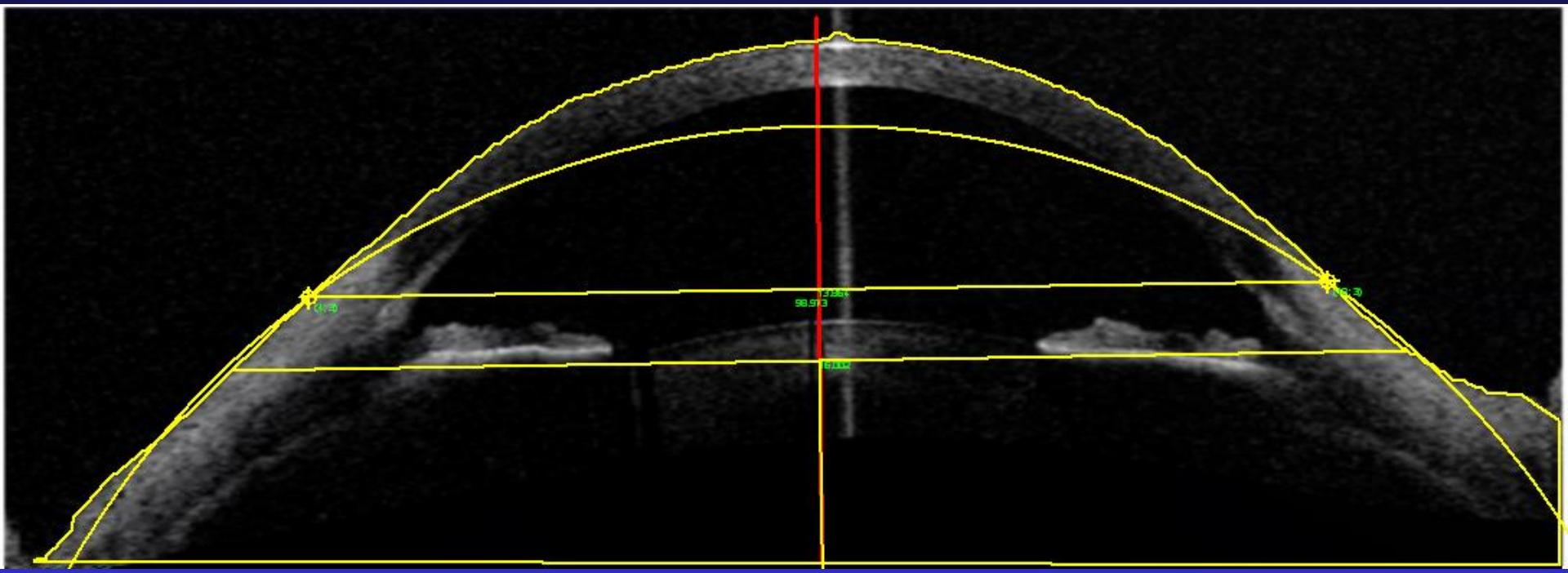


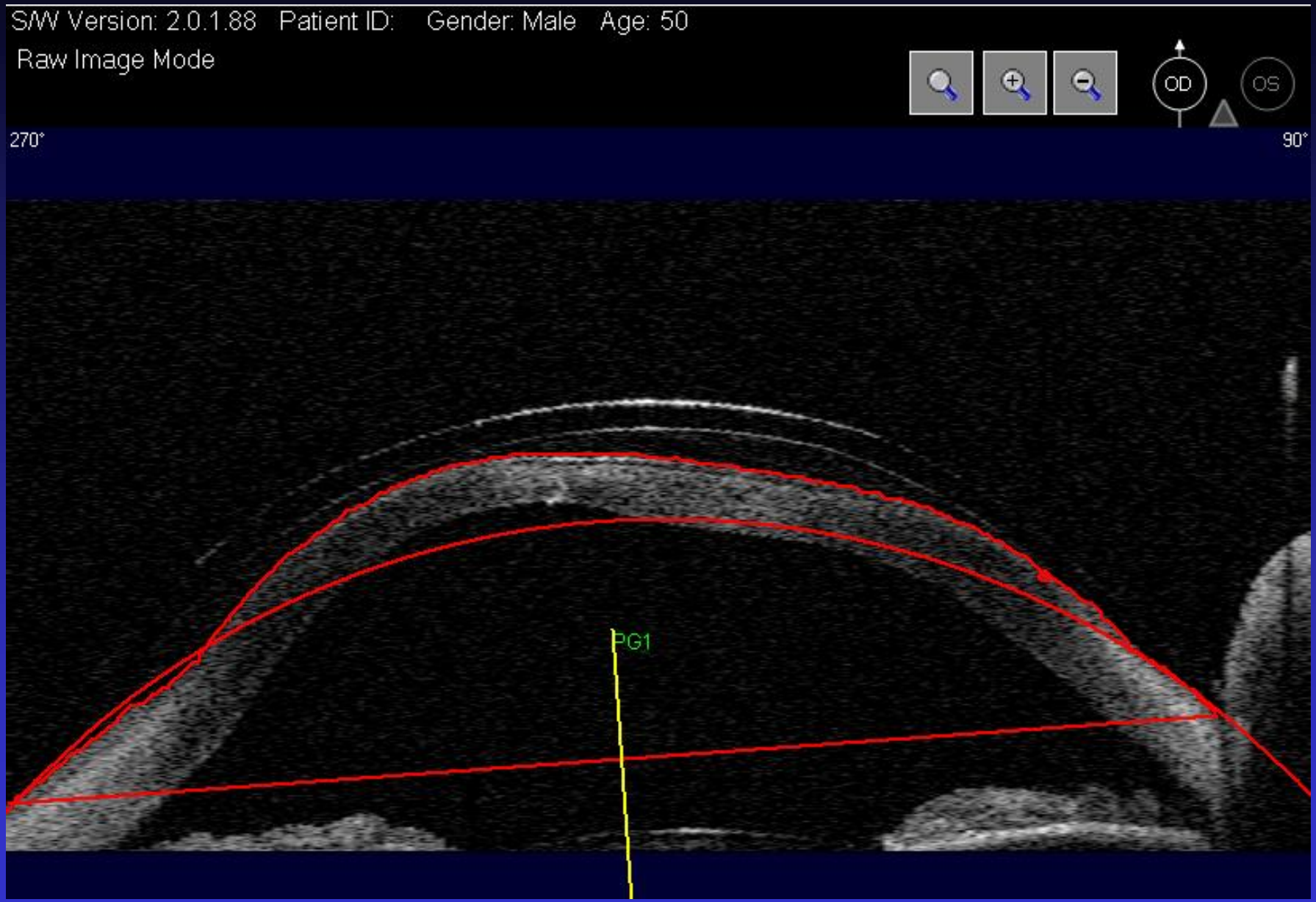
Nasal Scan

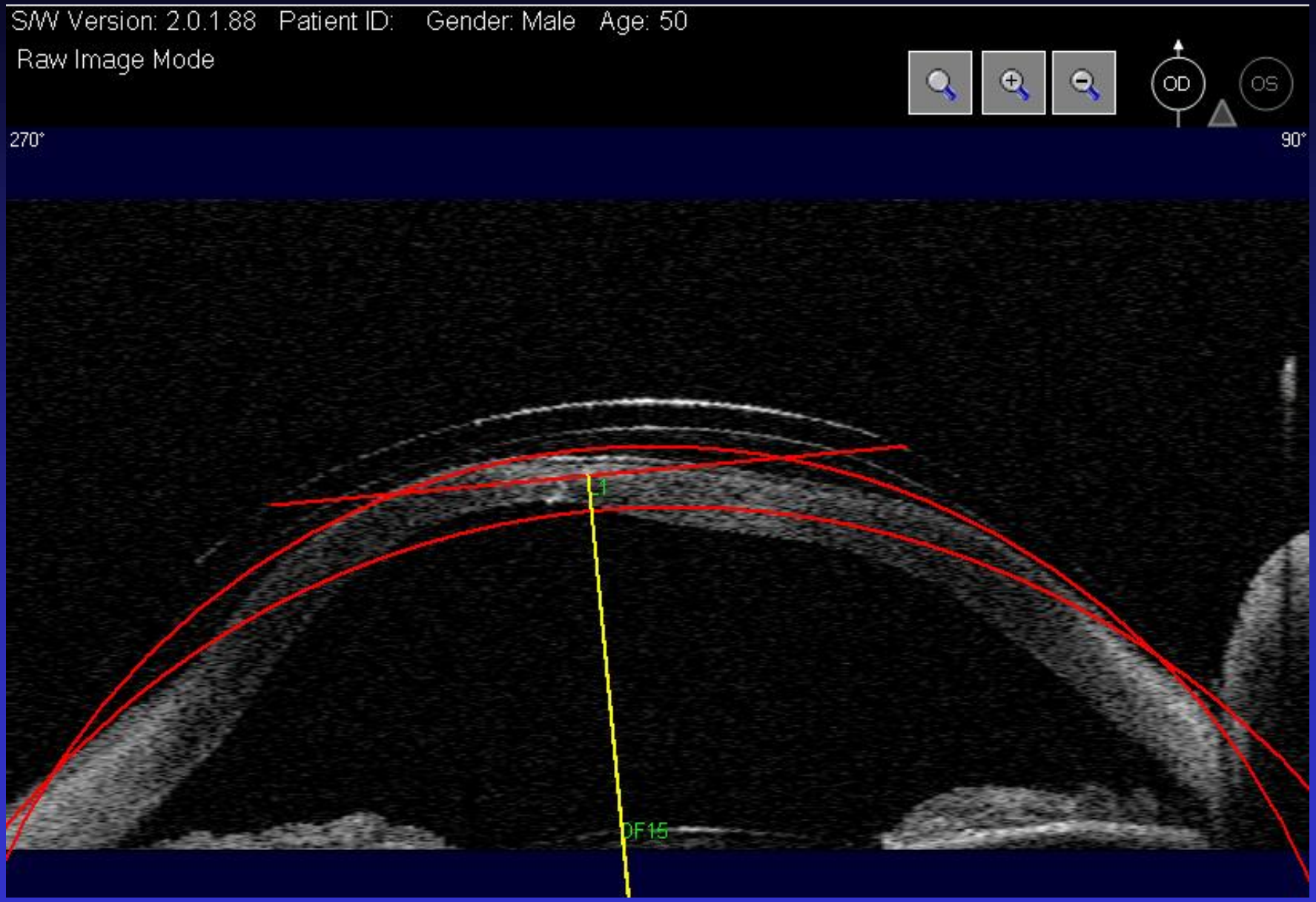


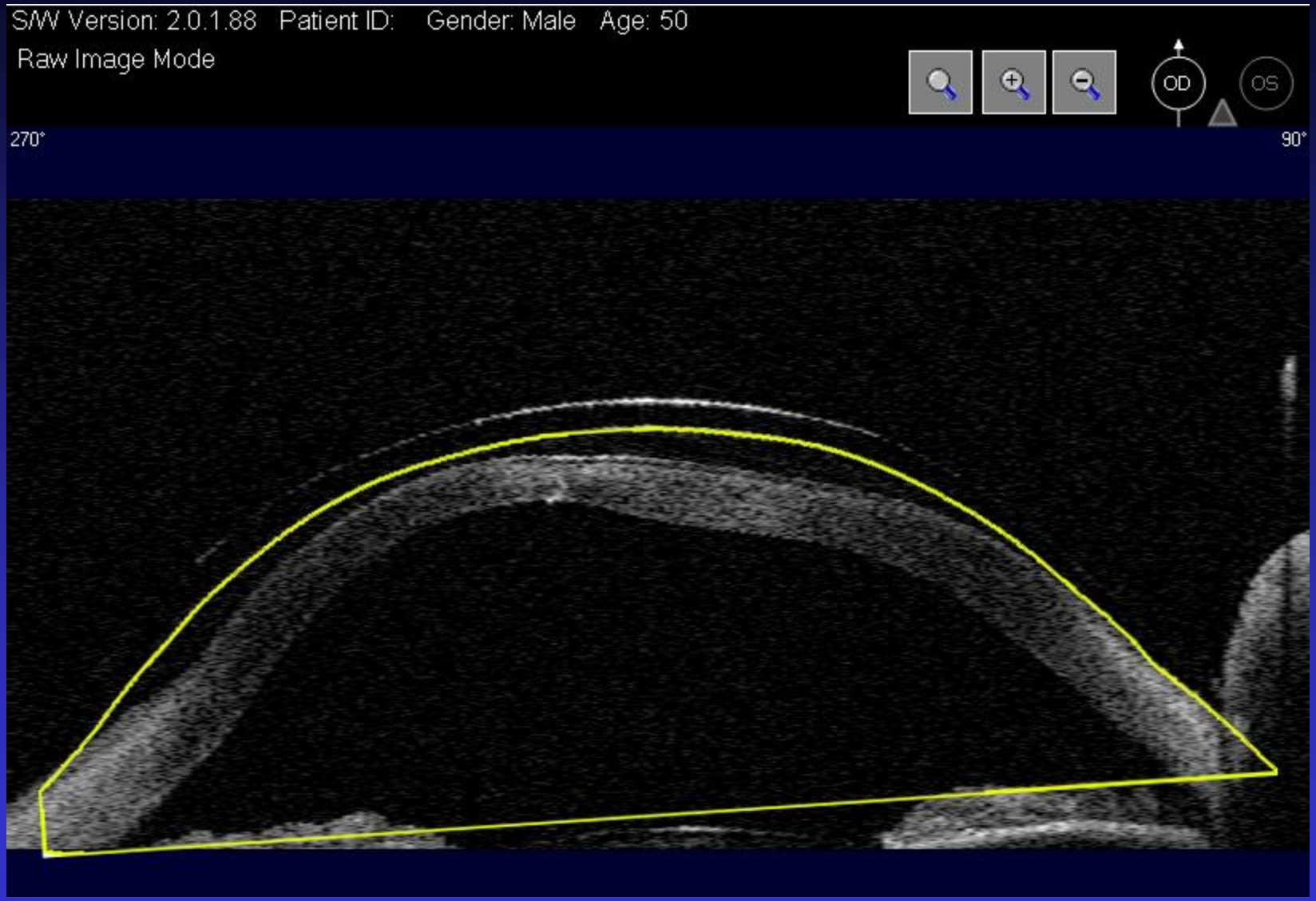
Composite

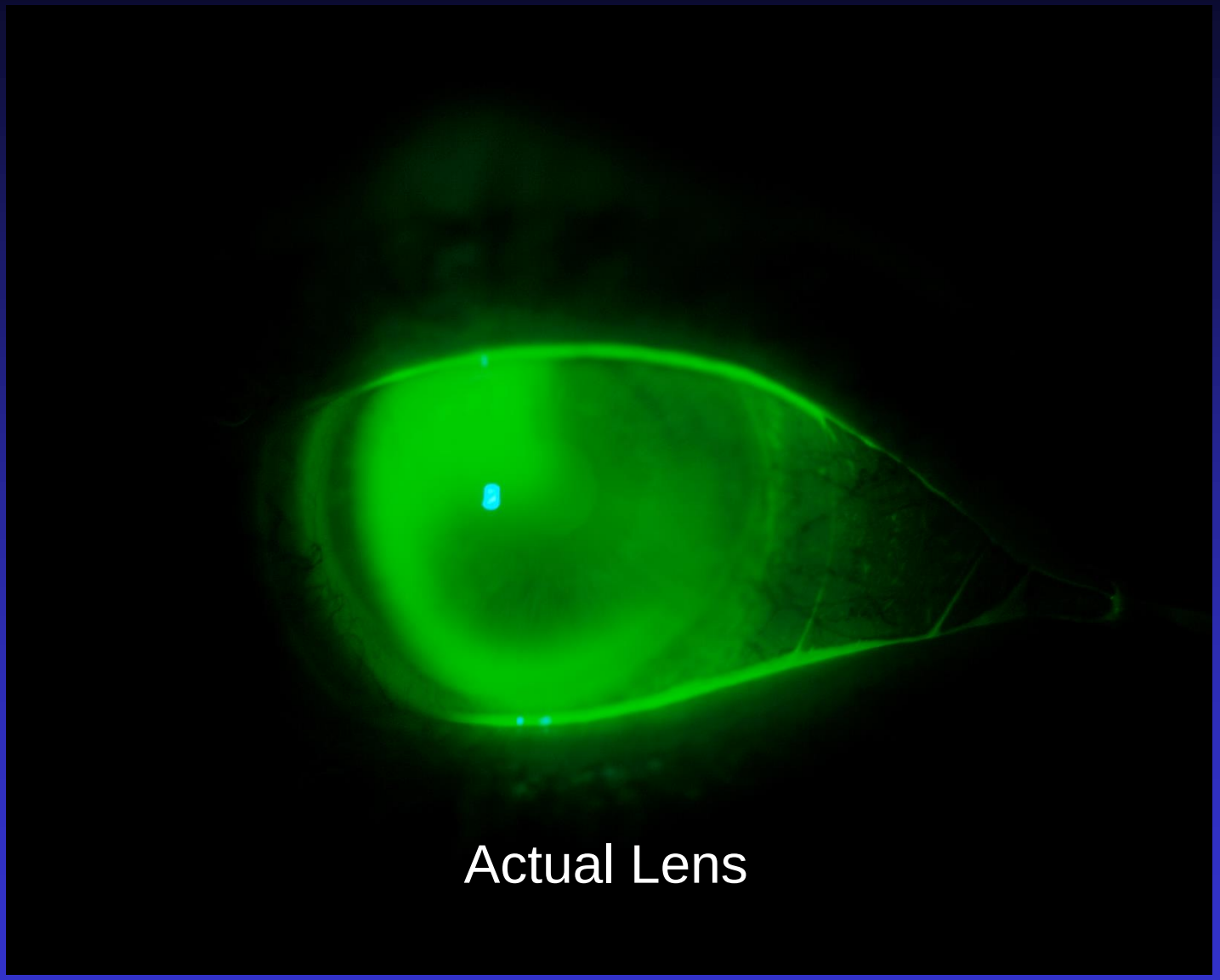








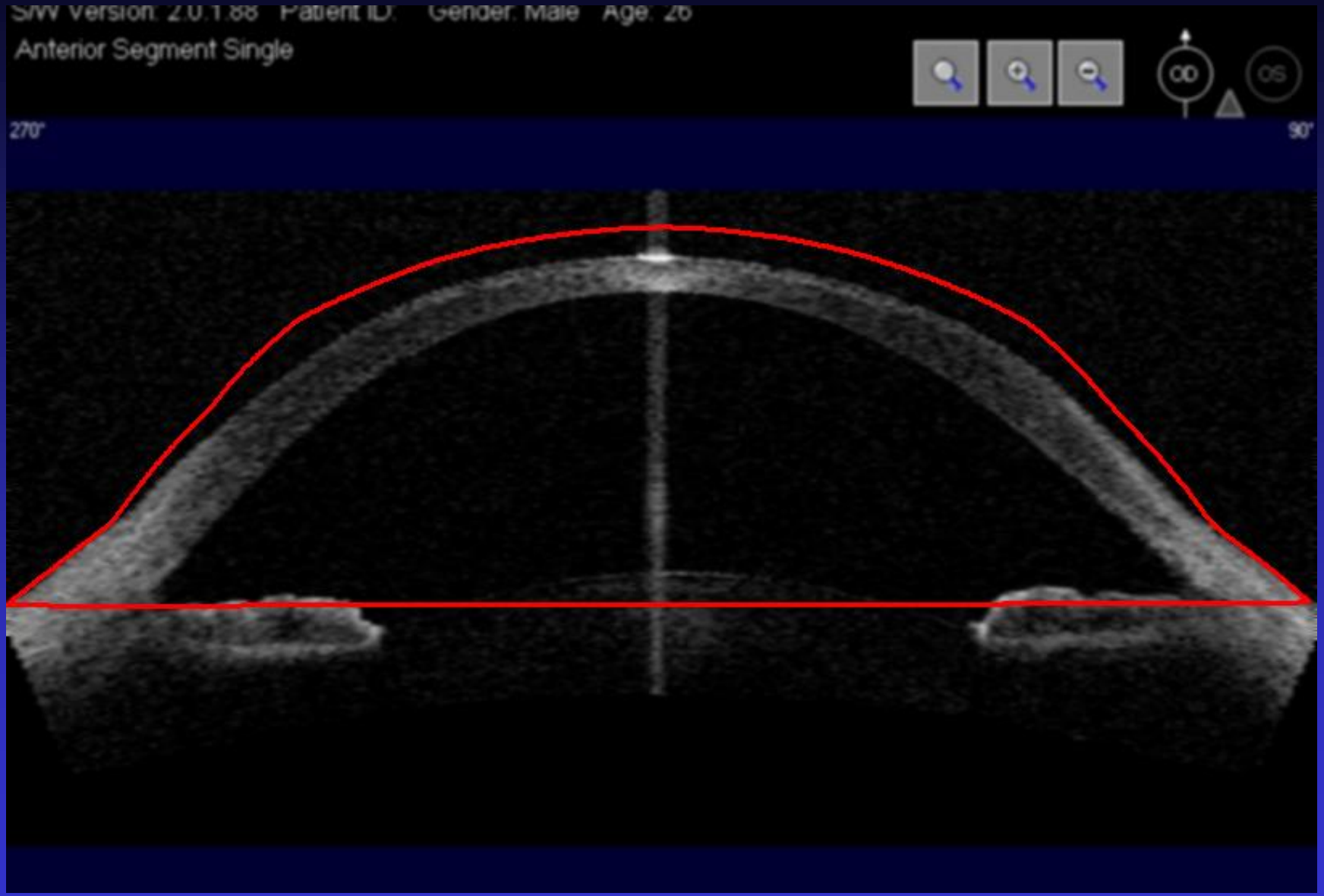




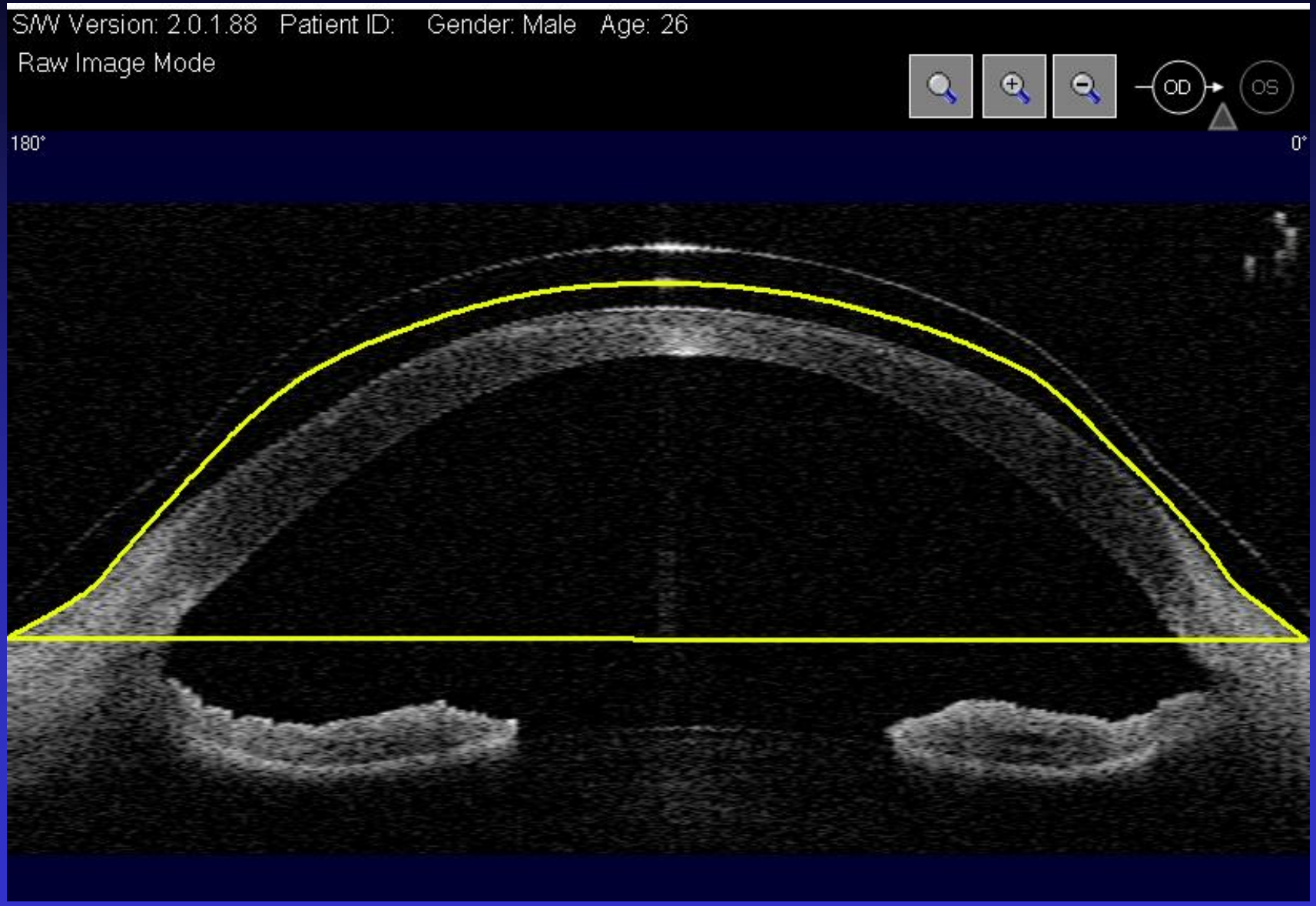
Actual Lens

Quadrant Specific Design

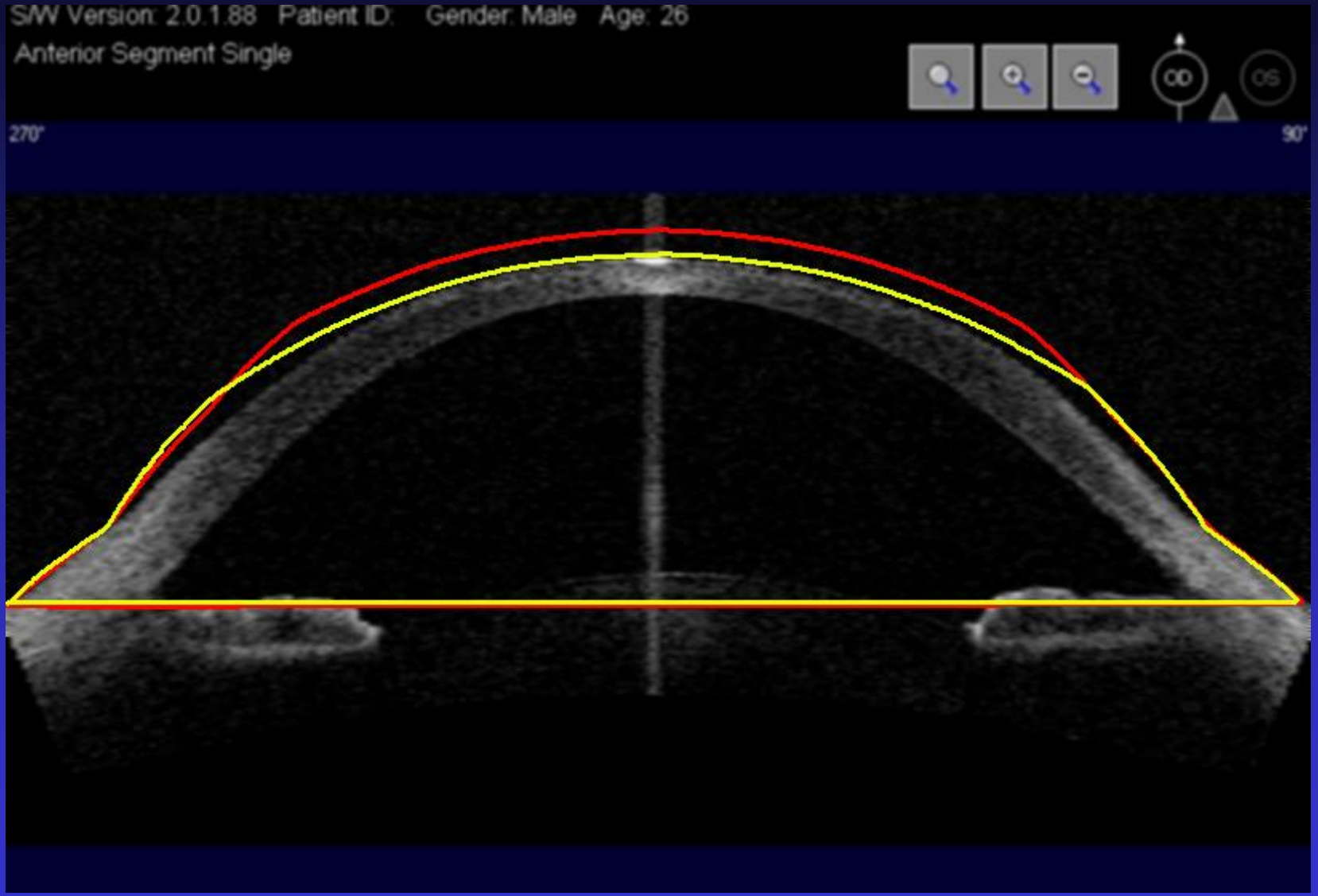
Proposed Design

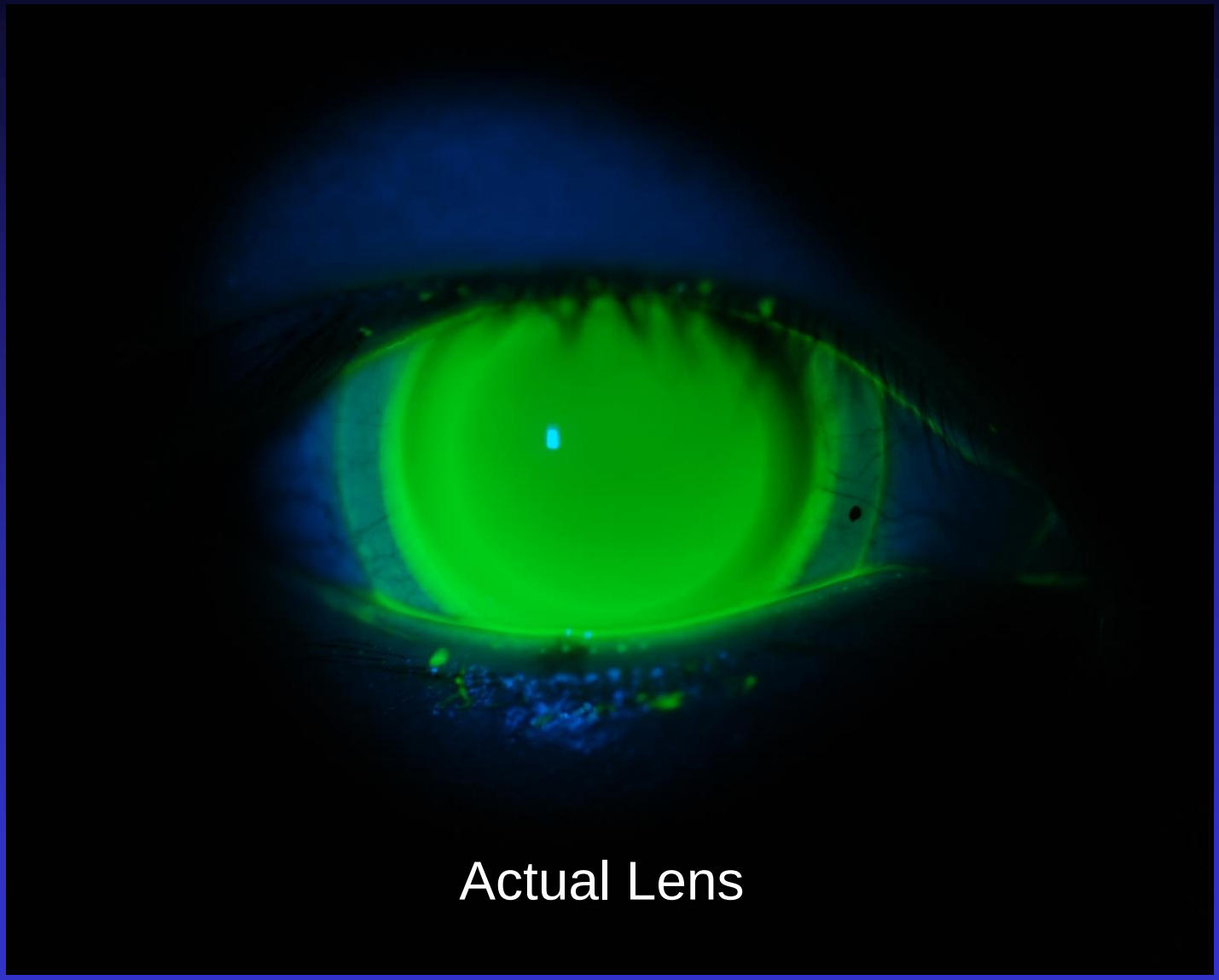


Actual Lens



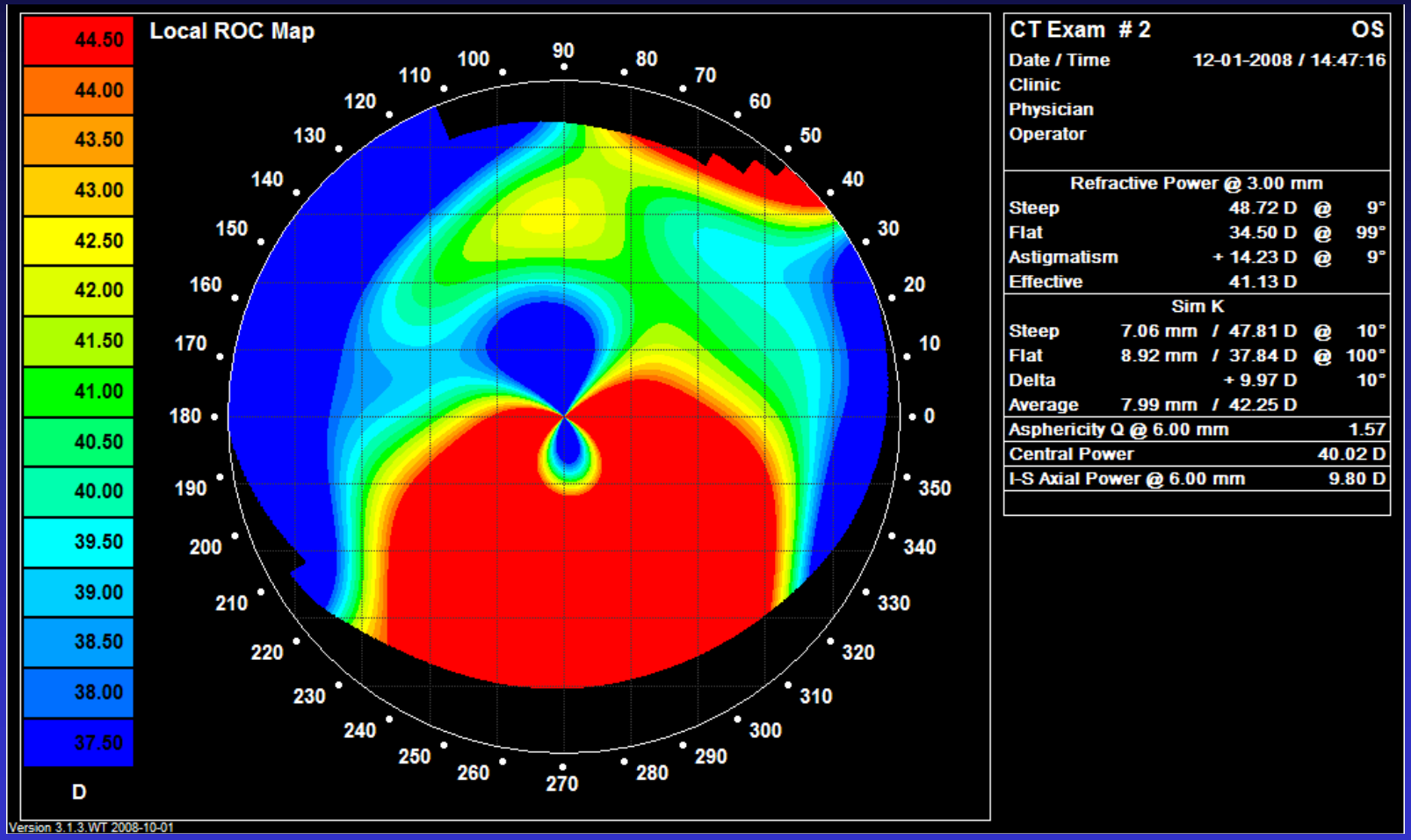
Scleral to Ortho-K





Actual Lens

Case Study



Case Study

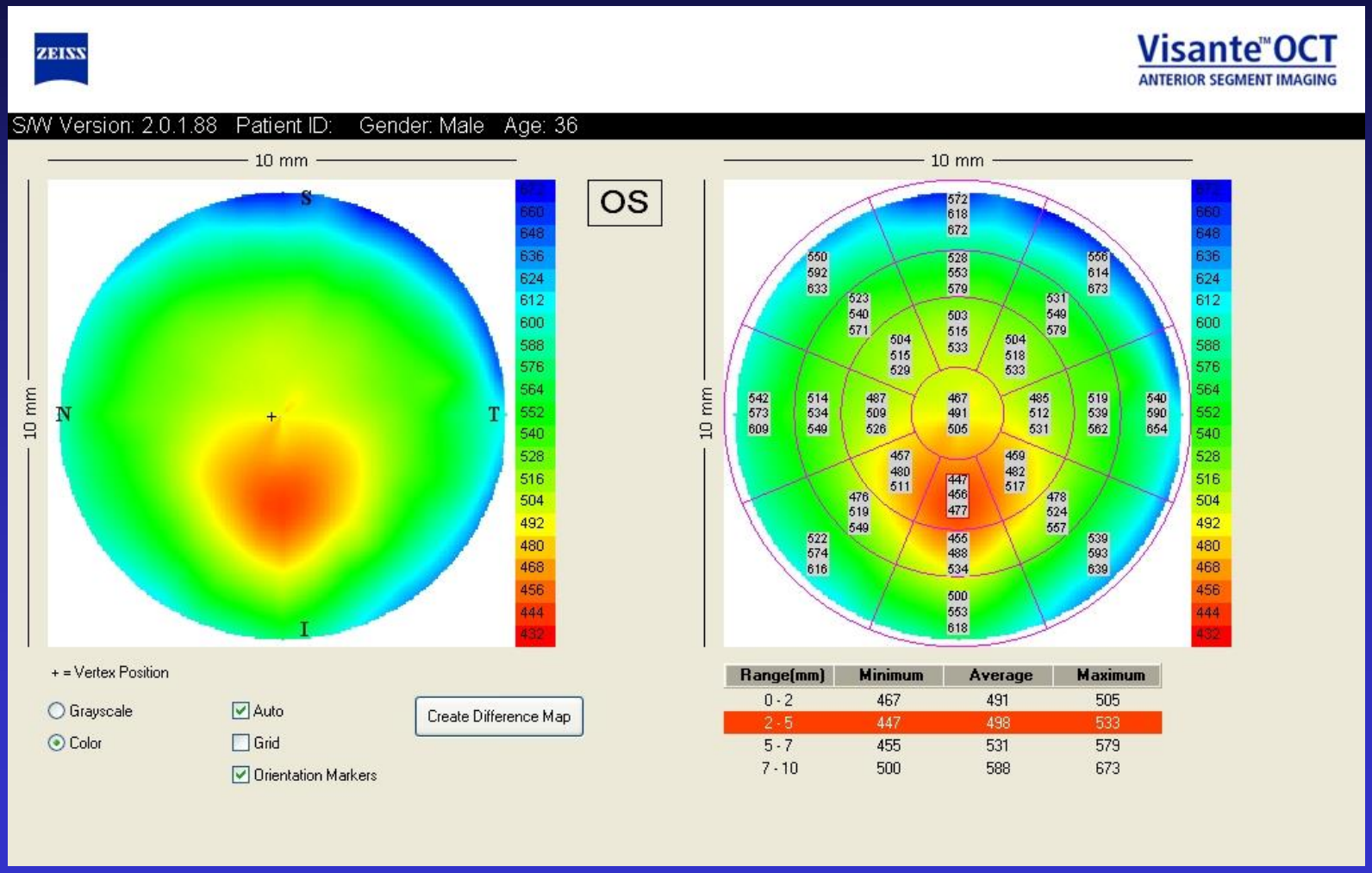
OCT Scan Axis 180

Case Study

OCT Scan Axis 90

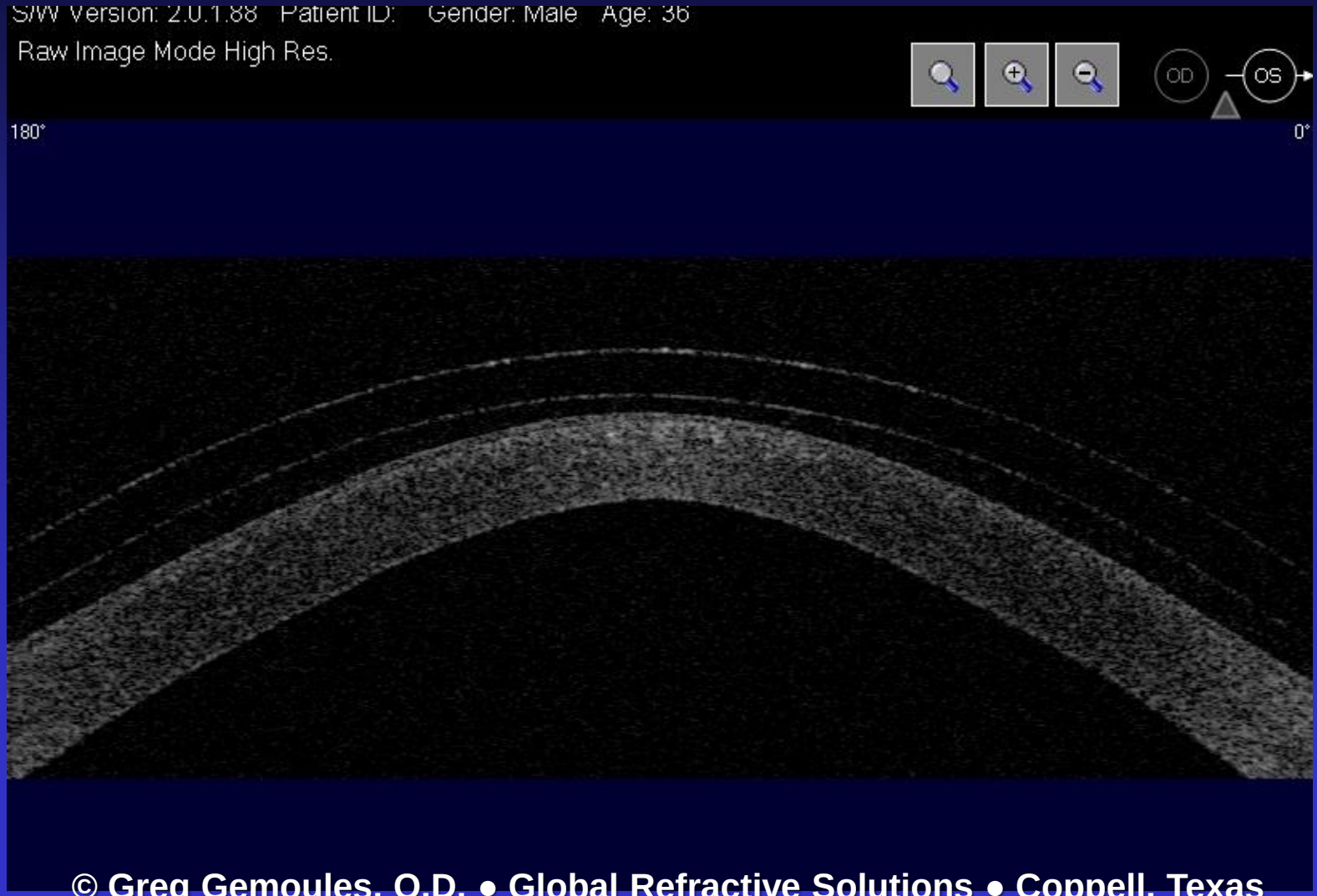
Case Study

Global Pachymetry



Case Study

Scleral Lens High Resolution



Case Study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Retrospective Study (June 2008)

65 Eyes of 34 Patients

Non-Surgical = 16 patients

- Keratoconus = 4
- Others = 12

Surgical = 18 patients

- MLASIK = 6
- HLASIK = 2
- RK = 6
- PRK = 1
- PKP = 2
- Cataract = 1

Results

- 65 Eyes Required 182 Lenses or 2.8 Lenses Per Eye (5 maximum)
- Materials Used = Boston XO
- Diameters ranged from 14.5 mm to 16.0 mm with a median of 15.0 mm
- 50% of lenses are bitoric or quadrant specific

Results

Success Rate

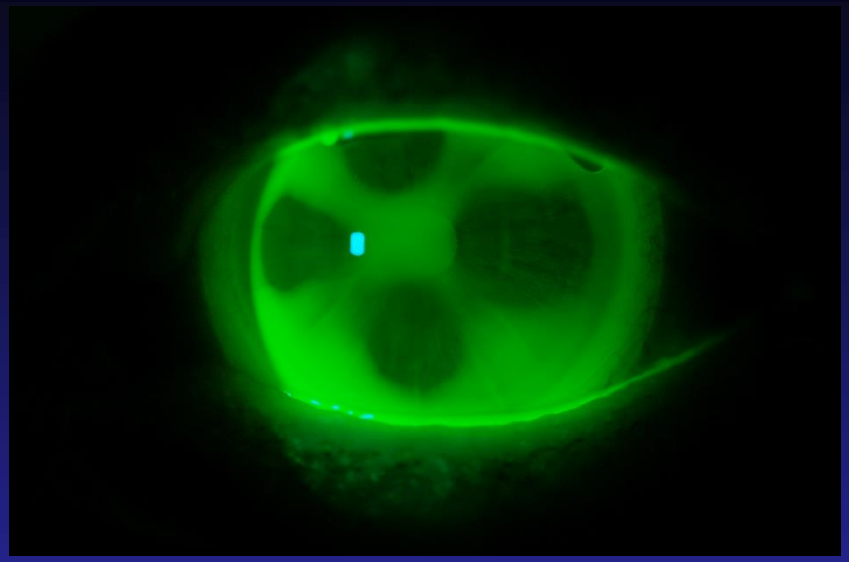
3 patients discontinued wear

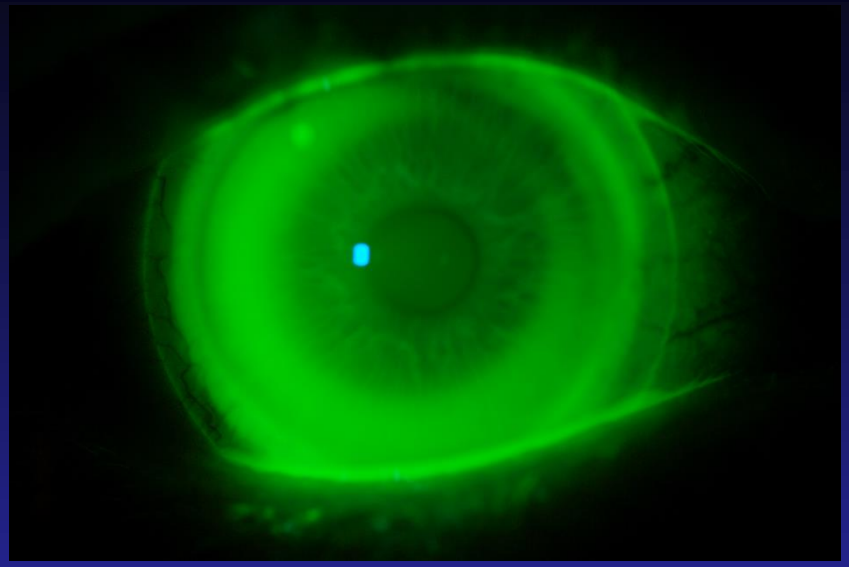
- dryness = 1
- corneal abrasion (self-inflicted) = 1
- failure of multifocal vision = 1
- 91% success rate

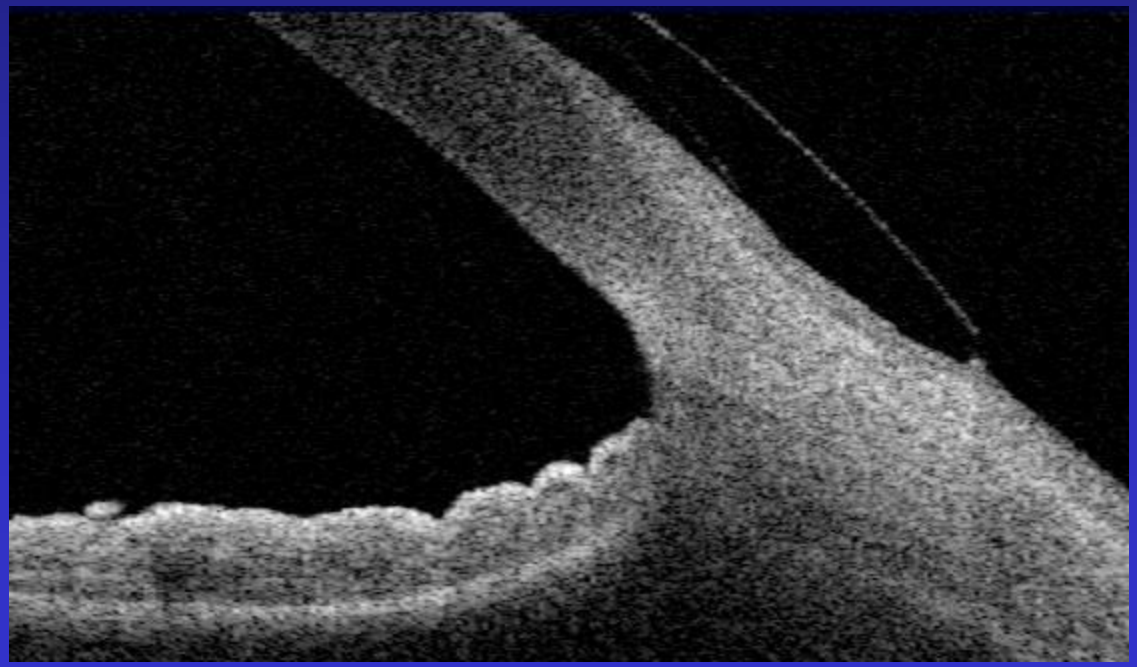
Vision

98% achieved 20/20

70% average reduction in total HOA rms







Thanks to
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