INTERNATIONAL CONGRESS OF THE
EGYPTIAN
OPHTHALMOLOGICAL SOCIETY

In collaboration with: MEACO

# Comparing very challenging situations in Cataract Surgery

# Phaco in Short Eyes

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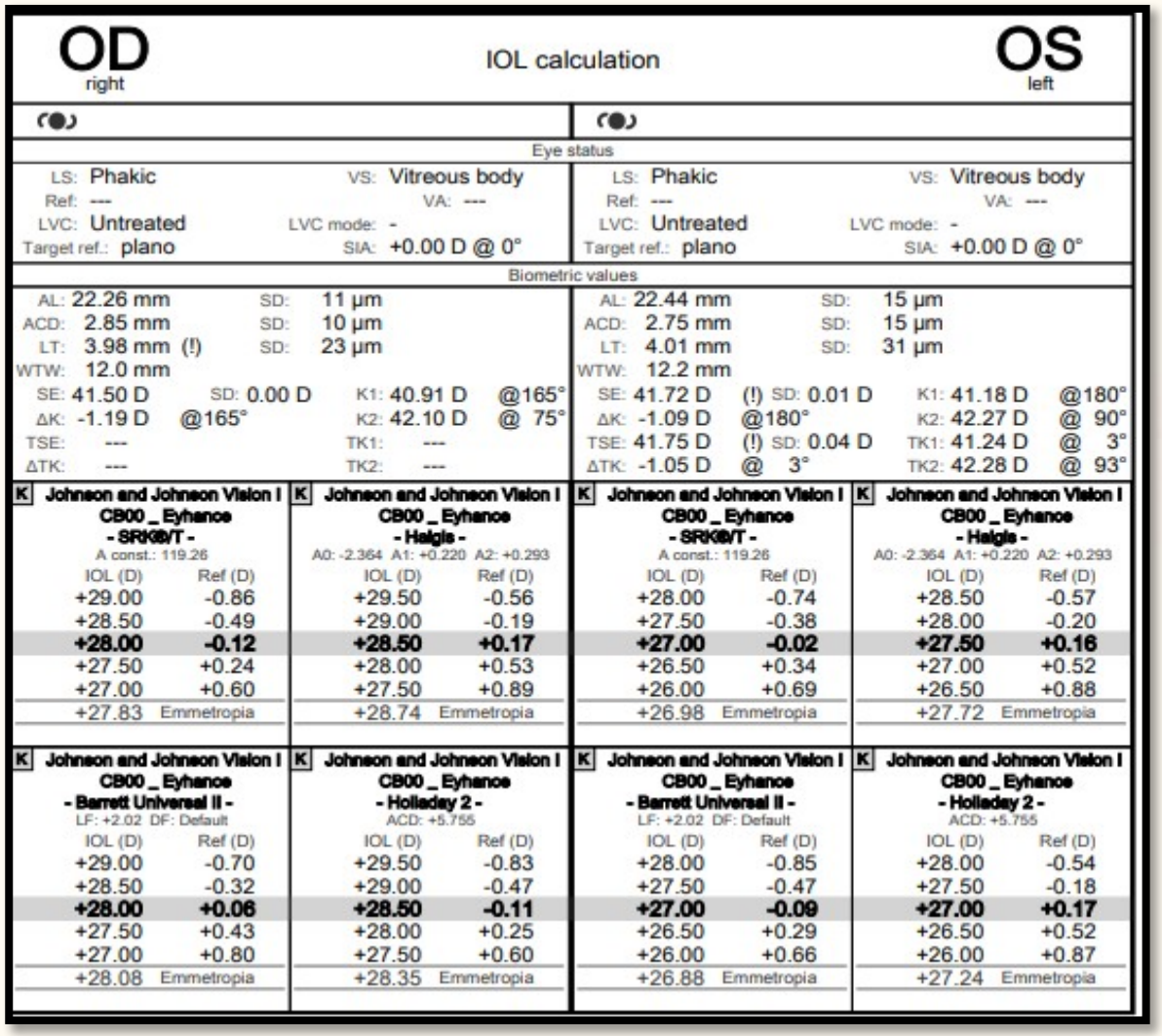
# Phaco in short eyes can be a big problem

# What is your definition of a short eye ??

**Do you depend on the preoperative refraction and glasses ?**

+5 D  +7 D  +10 D  +16 D

# Do you depend on the biometry?



**OD** right — IOL calculation — **OS** left

| | OD (right) | OS (left) |
|---|---|---|
| **Eye status** | | |
| LS | Phakic | Phakic |
| VS | Vitreous body | Vitreous body |
| Ref | --- | --- |
| VA | --- | --- |
| LVC | Untreated | Untreated |
| LVC mode | - | - |
| Target ref. | plano | plano |
| SIA | +0.00 D @ 0° | +0.00 D @ 0° |
| **Biometric values** | | |
| AL | 22.26 mm | 22.44 mm |
| SD | 11 µm | 15 µm |
| ACD | 2.85 mm | 2.75 mm |
| SD | 10 µm | 15 µm |
| LT | 3.98 mm (!) | 4.01 mm |
| SD | 23 µm | 31 µm |
| WTW | 12.0 mm | 12.2 mm |
| SE | 41.50 D | 41.72 D (!) |
| SD | 0.00 D | 0.01 D |
| K1 | 40.91 D @165° | 41.18 D @180° |
| ΔK | -1.19 D @165° | -1.09 D @180° |
| K2 | 42.10 D @ 75° | 42.27 D @ 90° |
| TSE | --- | 41.75 D (!) |
| SD | | 0.04 D |
| TK1 | --- | 41.24 D @ 3° |
| ΔTK | --- | -1.05 D @ 3° |
| TK2 | --- | 42.28 D @ 93° |

**K Johnson and Johnson Vision I CB00 _ Eyhance - SRK/T -** (A const.: 119.26)

| OD IOL (D) | OD Ref (D) | OS IOL (D) | OS Ref (D) |
|---|---|---|---|
| +29.00 | -0.86 | +28.00 | -0.74 |
| +28.50 | -0.49 | +27.50 | -0.38 |
| **+28.00** | **-0.12** | **+27.00** | **-0.02** |
| +27.50 | +0.24 | +26.50 | +0.34 |
| +27.00 | +0.60 | +26.00 | +0.69 |
| +27.83 | Emmetropia | +26.98 | Emmetropia |

**K Johnson and Johnson Vision I CB00 _ Eyhance - Haigis -** (A0: -2.364 A1: +0.220 A2: +0.293)

| OD IOL (D) | OD Ref (D) | OS IOL (D) | OS Ref (D) |
|---|---|---|---|
| +29.50 | -0.56 | +28.50 | -0.57 |
| +29.00 | -0.19 | +27.50 | -0.20 |
| **+28.50** | **+0.17** | **+27.50** | **+0.16** |
| +28.00 | +0.53 | +27.00 | +0.52 |
| +27.50 | +0.89 | +26.50 | +0.88 |
| +28.74 | Emmetropia | +27.72 | Emmetropia |

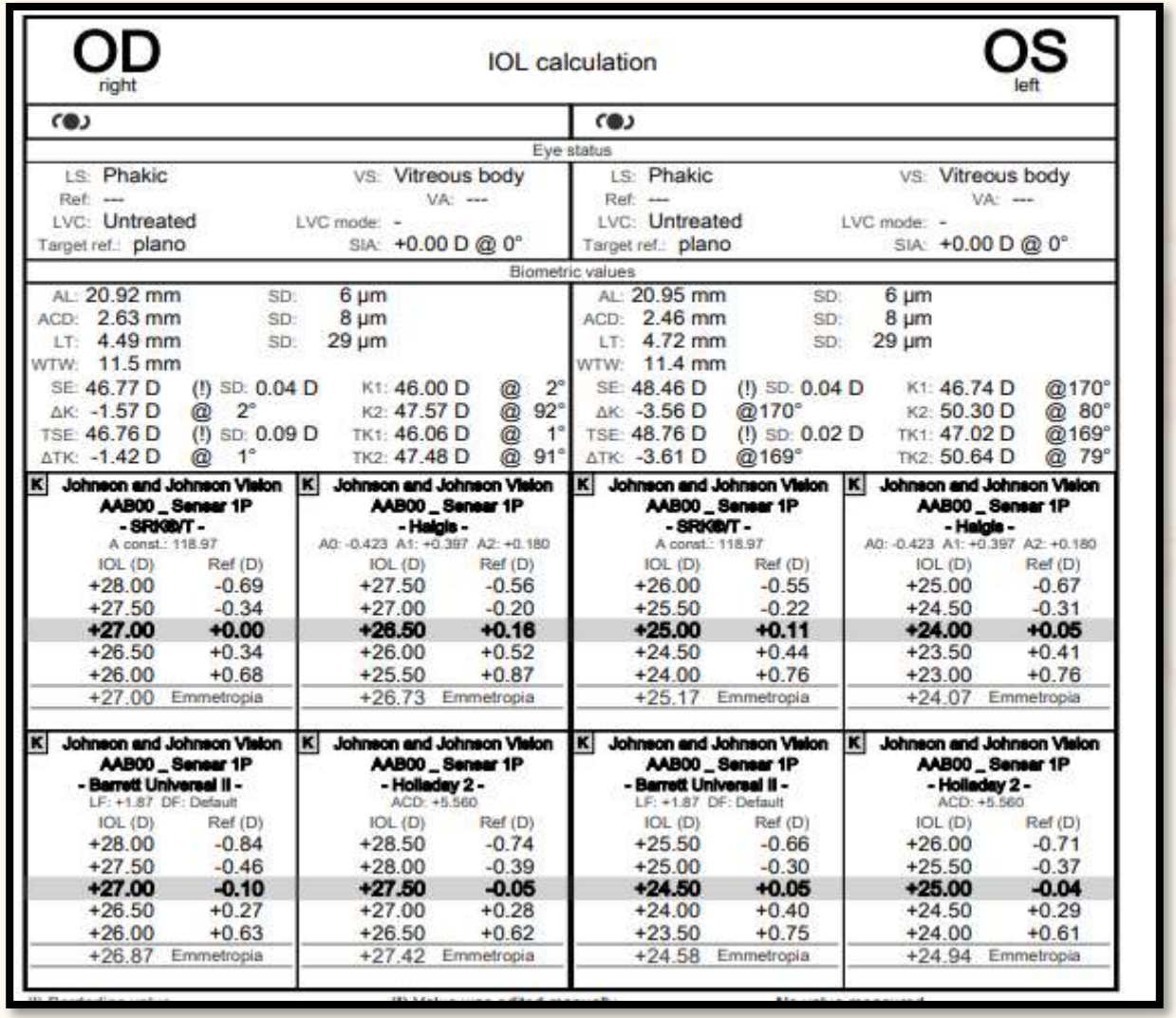
**K Johnson and Johnson Vision I CB00 _ Eyhance - Barrett Universal II -** (LF: +2.02 DF: Default)

| OD IOL (D) | OD Ref (D) | OS IOL (D) | OS Ref (D) |
|---|---|---|---|
| +29.00 | -0.70 | +28.00 | -0.85 |
| +28.50 | -0.32 | +27.50 | -0.47 |
| **+28.00** | **+0.06** | **+27.00** | **-0.09** |
| +27.50 | +0.43 | +26.50 | +0.29 |
| +27.00 | +0.80 | +26.00 | +0.66 |
| +28.08 | Emmetropia | +26.88 | Emmetropia |

**K Johnson and Johnson Vision I CB00 _ Eyhance - Holladay 2 -** (ACD: +5.755)

| OD IOL (D) | OD Ref (D) | OS IOL (D) | OS Ref (D) |
|---|---|---|---|
| +29.50 | -0.83 | +28.00 | -0.54 |
| +29.00 | -0.47 | +27.50 | -0.18 |
| **+28.50** | **-0.11** | **+27.00** | **+0.17** |
| +28.00 | +0.25 | +26.50 | +0.52 |
| +27.50 | +0.60 | +26.00 | +0.87 |
| +28.35 | Emmetropia | +27.24 | Emmetropia |

# Do you depend on the biometry?



**OD** right — IOL calculation — **OS** left

**Eye status**

| OD (right) | OS (left) |
|---|---|
| LS: Phakic | LS: Phakic |
| Ref: --- | Ref: --- |
| LVC: Untreated | LVC: Untreated |
| Target ref.: plano | Target ref.: plano |
| VS: Vitreous body | VS: Vitreous body |
| VA: --- | VA: --- |
| LVC mode: - | LVC mode: - |
| SIA: +0.00 D @ 0° | SIA: +0.00 D @ 0° |

**Biometric values**

| | OD (right) | | OS (left) | |
|---|---|---|---|---|
| AL: | 20.92 mm | SD: 6 µm | 20.95 mm | SD: 6 µm |
| ACD: | 2.63 mm | SD: 8 µm | 2.46 mm | SD: 8 µm |
| LT: | 4.49 mm | SD: 29 µm | 4.72 mm | SD: 29 µm |
| WTW: | 11.5 mm | | 11.4 mm | |
| SE: | 46.77 D | (!) SD: 0.04 D | 48.46 D | (!) SD: 0.04 D |
| ΔK: | -1.57 D | @ 2° | -3.56 D | @170° |
| TSE: | 46.76 D | (!) SD: 0.09 D | 48.76 D | (!) SD: 0.02 D |
| ΔTK: | -1.42 D | @ 1° | -3.61 D | @169° |
| K1: | 46.00 D | @ 2° | 46.74 D | @170° |
| K2: | 47.57 D | @ 92° | 50.30 D | @ 80° |
| TK1: | 46.06 D | @ 1° | 47.02 D | @169° |
| TK2: | 47.48 D | @ 91° | 50.64 D | @ 79° |

**K Johnson and Johnson Vision AAB00 _ Sensar 1P - SRK/T -** (A const.: 118.97)

| IOL (D) | Ref (D) |
|---|---|
| +28.00 | -0.69 |
| +27.50 | -0.34 |
| **+27.00** | **+0.00** |
| +26.50 | +0.34 |
| +26.00 | +0.68 |
| +27.00 | Emmetropia |

**K Johnson and Johnson Vision AAB00 _ Sensar 1P - Haigis -** (A0: -0.423 A1: +0.397 A2: +0.180)

| IOL (D) | Ref (D) |
|---|---|
| +27.50 | -0.56 |
| +27.00 | -0.20 |
| **+26.50** | **+0.16** |
| +26.00 | +0.52 |
| +25.50 | +0.87 |
| +26.73 | Emmetropia |

**K Johnson and Johnson Vision AAB00 _ Sensar 1P - SRK/T -** (A const.: 118.97)

| IOL (D) | Ref (D) |
|---|---|
| +26.00 | -0.55 |
| +25.50 | -0.22 |
| **+25.00** | **+0.11** |
| +24.50 | +0.44 |
| +24.00 | +0.76 |
| +25.17 | Emmetropia |

**K Johnson and Johnson Vision AAB00 _ Sensar 1P - Haigis -** (A0: -0.423 A1: +0.397 A2: +0.180)

| IOL (D) | Ref (D) |
|---|---|
| +25.00 | -0.67 |
| +24.50 | -0.31 |
| **+24.00** | **+0.05** |
| +23.50 | +0.41 |
| +23.00 | +0.76 |
| +24.07 | Emmetropia |

**K Johnson and Johnson Vision AAB00 _ Sensar 1P - Barrett Universal II -** (LF: +1.87 DF: Default)

| IOL (D) | Ref (D) |
|---|---|
| +28.00 | -0.84 |
| +27.50 | -0.46 |
| **+27.00** | **-0.10** |
| +26.50 | +0.27 |
| +26.00 | +0.63 |
| +26.87 | Emmetropia |

**K Johnson and Johnson Vision AAB00 _ Sensar 1P - Holladay 2 -** (ACD: +5.560)

| IOL (D) | Ref (D) |
|---|---|
| +28.50 | -0.74 |
| +28.00 | -0.39 |
| **+27.50** | **-0.05** |
| +27.00 | +0.28 |
| +26.50 | +0.62 |
| +27.42 | Emmetropia |

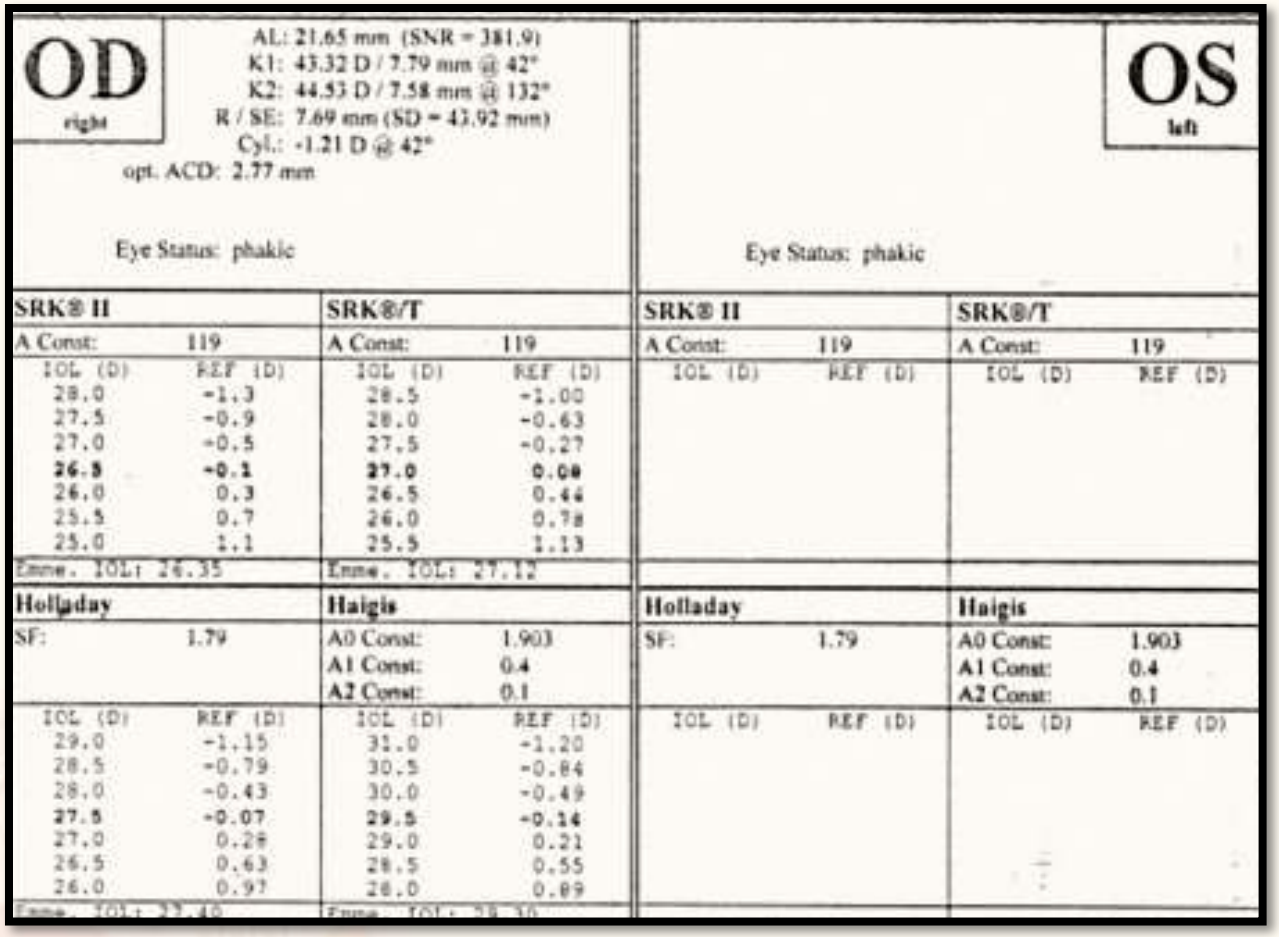
**K Johnson and Johnson Vision AAB00 _ Sensar 1P - Barrett Universal II -** (LF: +1.87 DF: Default)

| IOL (D) | Ref (D) |
|---|---|
| +25.50 | -0.66 |
| +25.00 | -0.30 |
| **+24.50** | **+0.05** |
| +24.00 | +0.40 |
| +23.50 | +0.75 |
| +24.58 | Emmetropia |

**K Johnson and Johnson Vision AAB00 _ Sensar 1P - Holladay 2 -** (ACD: +5.560)

| IOL (D) | Ref (D) |
|---|---|
| +26.00 | -0.71 |
| +25.50 | -0.37 |
| **+25.00** | **-0.04** |
| +24.50 | +0.29 |
| +24.00 | +0.61 |
| +24.94 | Emmetropia |

# Do you depend on the biometry?



**OD** right

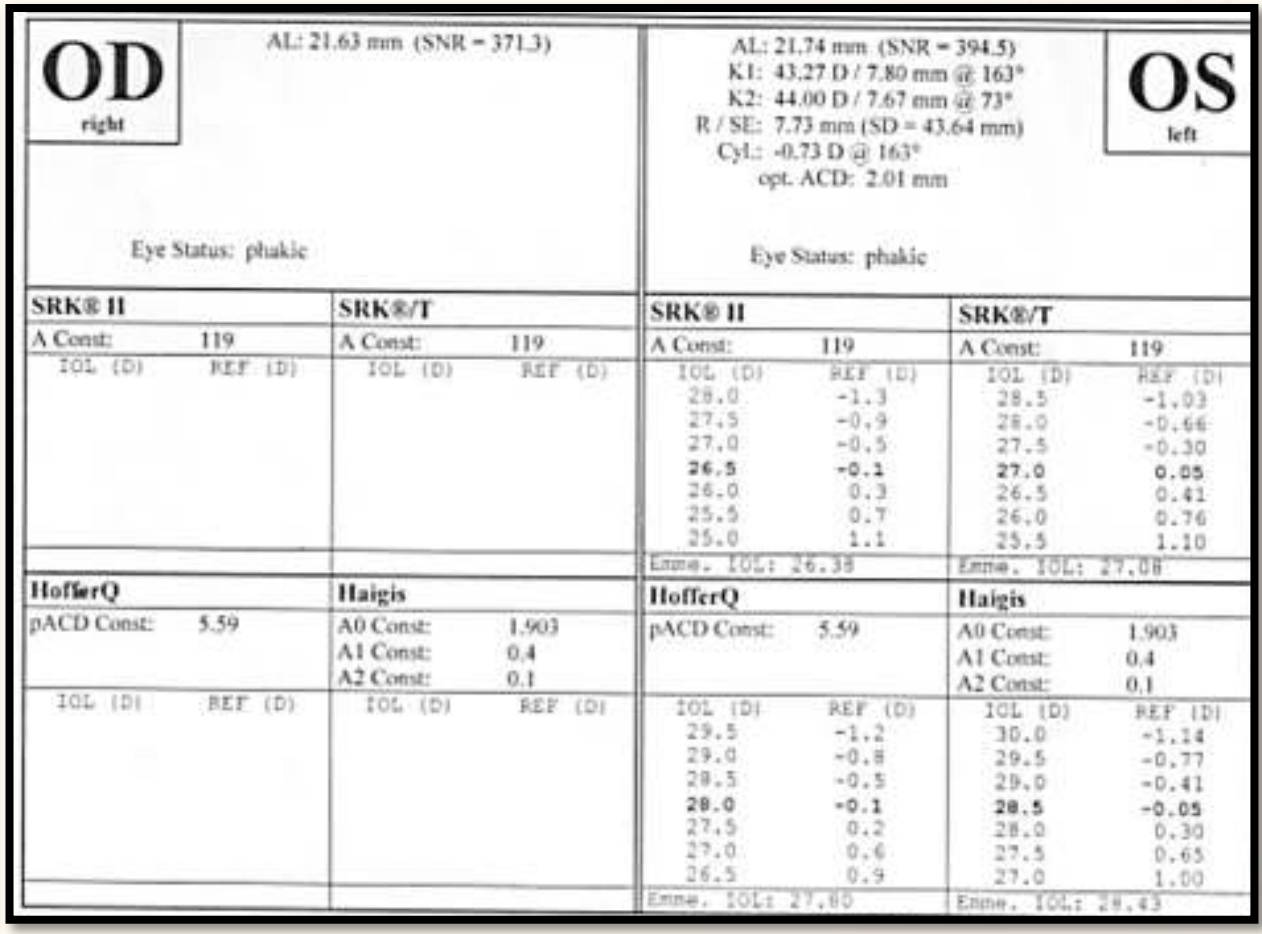
AL: 21.65 mm (SNR = 381.9)
K1: 43.32 D / 7.79 mm @ 42°
K2: 44.53 D / 7.58 mm @ 132°
R / SE: 7.69 mm (SD = 43.92 mm)
Cyl.: -1.21 D @ 42°
opt. ACD: 2.77 mm

Eye Status: phakic

**OS** left

Eye Status: phakic

| SRK® II | | SRK®/T | | SRK® II | | SRK®/T | |
|---|---|---|---|---|---|---|---|
| A Const: | 119 | A Const: | 119 | A Const: | 119 | A Const: | 119 |
| IOL (D) | REF (D) | IOL (D) | REF (D) | IOL (D) | REF (D) | IOL (D) | REF (D) |
| 28.0 | -1.3 | 28.5 | -1.00 | | | | |
| 27.5 | -0.9 | 28.0 | -0.63 | | | | |
| 27.0 | -0.5 | 27.5 | -0.27 | | | | |
| **26.5** | **-0.1** | **27.0** | **0.09** | | | | |
| 26.0 | 0.3 | 26.5 | 0.44 | | | | |
| 25.5 | 0.7 | 26.0 | 0.78 | | | | |
| 25.0 | 1.1 | 25.5 | 1.13 | | | | |
| Emme. IOL: 26.35 | | Emme. IOL: 27.12 | | | | | |
| **Holladay** | | **Haigis** | | **Holladay** | | **Haigis** | |
| SF: | 1.79 | A0 Const: | 1.903 | SF: | 1.79 | A0 Const: | 1.903 |
| | | A1 Const: | 0.4 | | | A1 Const: | 0.4 |
| | | A2 Const: | 0.1 | | | A2 Const: | 0.1 |
| IOL (D) | REF (D) | IOL (D) | REF (D) | IOL (D) | REF (D) | IOL (D) | REF (D) |
| 29.0 | -1.15 | 31.0 | -1.20 | | | | |
| 28.5 | -0.79 | 30.5 | -0.84 | | | | |
| 28.0 | -0.43 | 30.0 | -0.49 | | | | |
| **27.5** | **-0.07** | **29.5** | **-0.14** | | | | |
| 27.0 | 0.28 | 29.0 | 0.21 | | | | |
| 26.5 | 0.63 | 28.5 | 0.55 | | | | |
| 26.0 | 0.97 | 28.0 | 0.89 | | | | |
| Emme. IOL: 27.40 | | Emme. IOL: 28.30 | | | | | |



**OD** right

AL: 21.63 mm (SNR = 371.3)

Eye Status: phakic

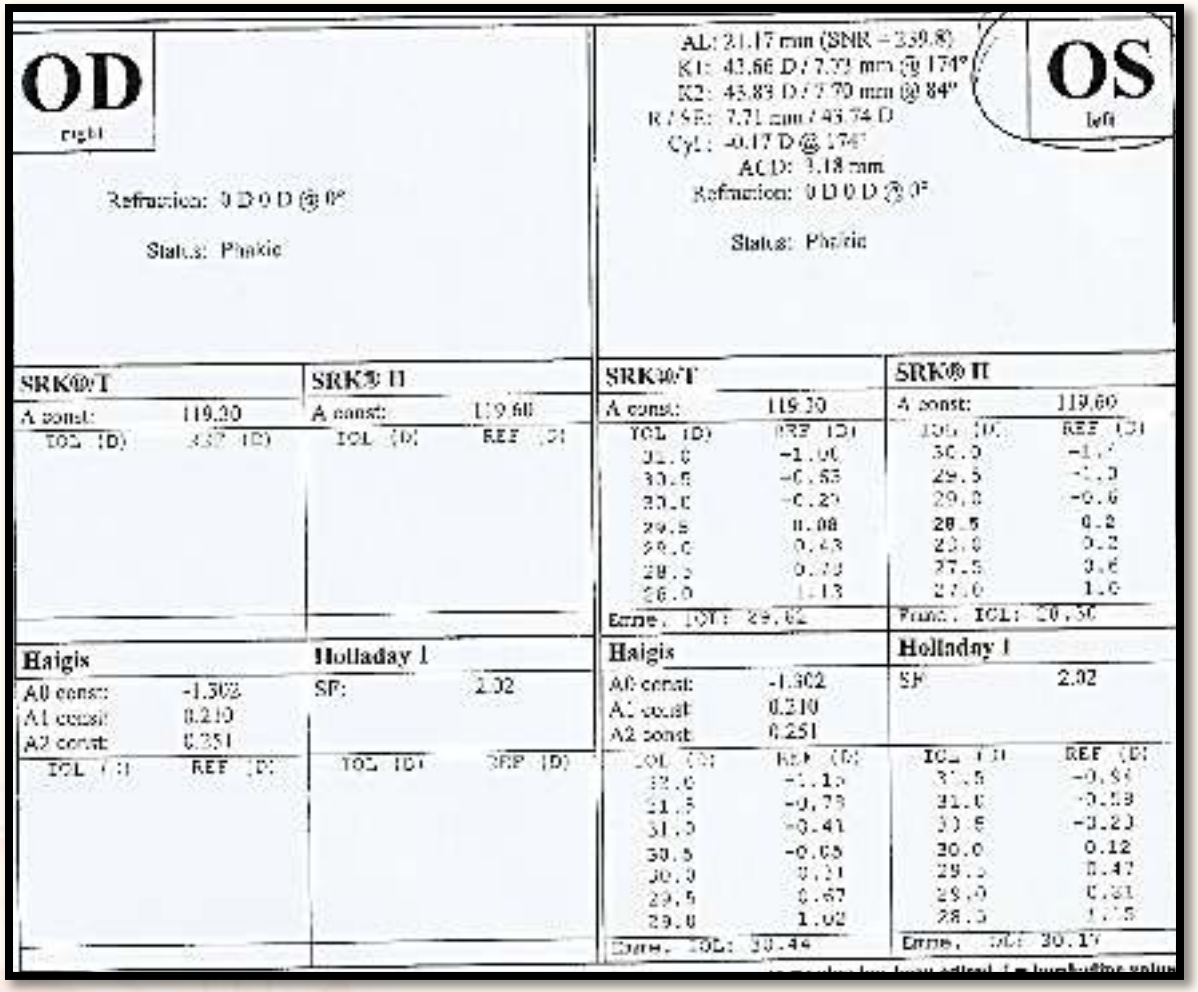
**OS** left

AL: 21.74 mm (SNR = 394.5)
K1: 43.27 D / 7.80 mm @ 163°
K2: 44.00 D / 7.67 mm @ 73°
R / SE: 7.73 mm (SD = 43.64 mm)
Cyl.: -0.73 D @ 163°
opt. ACD: 2.01 mm

Eye Status: phakic

| SRK® II | | SRK®/T | | SRK® II | | SRK®/T | |
|---|---|---|---|---|---|---|---|
| A Const: | 119 | A Const: | 119 | A Const: | 119 | A Const: | 119 |
| IOL (D) | REF (D) | IOL (D) | REF (D) | IOL (D) | REF (D) | IOL (D) | REF (D) |
| | | | | 28.0 | -1.3 | 28.5 | -1.03 |
| | | | | 27.5 | -0.9 | 28.0 | -0.66 |
| | | | | 27.0 | -0.5 | 27.5 | -0.30 |
| | | | | **26.5** | **-0.1** | **27.0** | **0.05** |
| | | | | 26.0 | 0.3 | 26.5 | 0.41 |
| | | | | 25.5 | 0.7 | 26.0 | 0.76 |
| | | | | 25.0 | 1.1 | 25.5 | 1.10 |
| | | | | Emme. IOL: 26.38 | | Emme. IOL: 27.08 | |
| **HofferQ** | | **Haigis** | | **HofferQ** | | **Haigis** | |
| pACD Const: | 5.59 | A0 Const: | 1.903 | pACD Const: | 5.59 | A0 Const: | 1.903 |
| | | A1 Const: | 0.4 | | | A1 Const: | 0.4 |
| | | A2 Const: | 0.1 | | | A2 Const: | 0.1 |
| IOL (D) | REF (D) | IOL (D) | REF (D) | IOL (D) | REF (D) | IOL (D) | REF (D) |
| | | | | 29.5 | -1.2 | 30.0 | -1.14 |
| | | | | 29.0 | -0.8 | 29.5 | -0.77 |
| | | | | 28.5 | -0.5 | 29.0 | -0.41 |
| | | | | **28.0** | **-0.1** | **28.5** | **-0.05** |
| | | | | 27.5 | 0.2 | 28.0 | 0.30 |
| | | | | 27.0 | 0.6 | 27.5 | 0.65 |
| | | | | 26.5 | 0.9 | 27.0 | 1.00 |
| | | | | Emme. IOL: 27.80 | | Emme. IOL: 28.43 | |

# Do you depend on the biometry?



**OD** right

Refraction: 0 D 0 D @ 0°

Status: Phakic

**OS** left

AL: 21.17 mm (SNR = 339.8)
K1: 43.66 D / 7.72 mm @ 174°
K2: 45.83 D / 7.70 mm @ 84°
R / SE: 7.71 mm / 45.74 D
Cyl.: -0.17 D @ 174°
ACD: 3.18 mm
Refraction: 0 D 0 D @ 0°

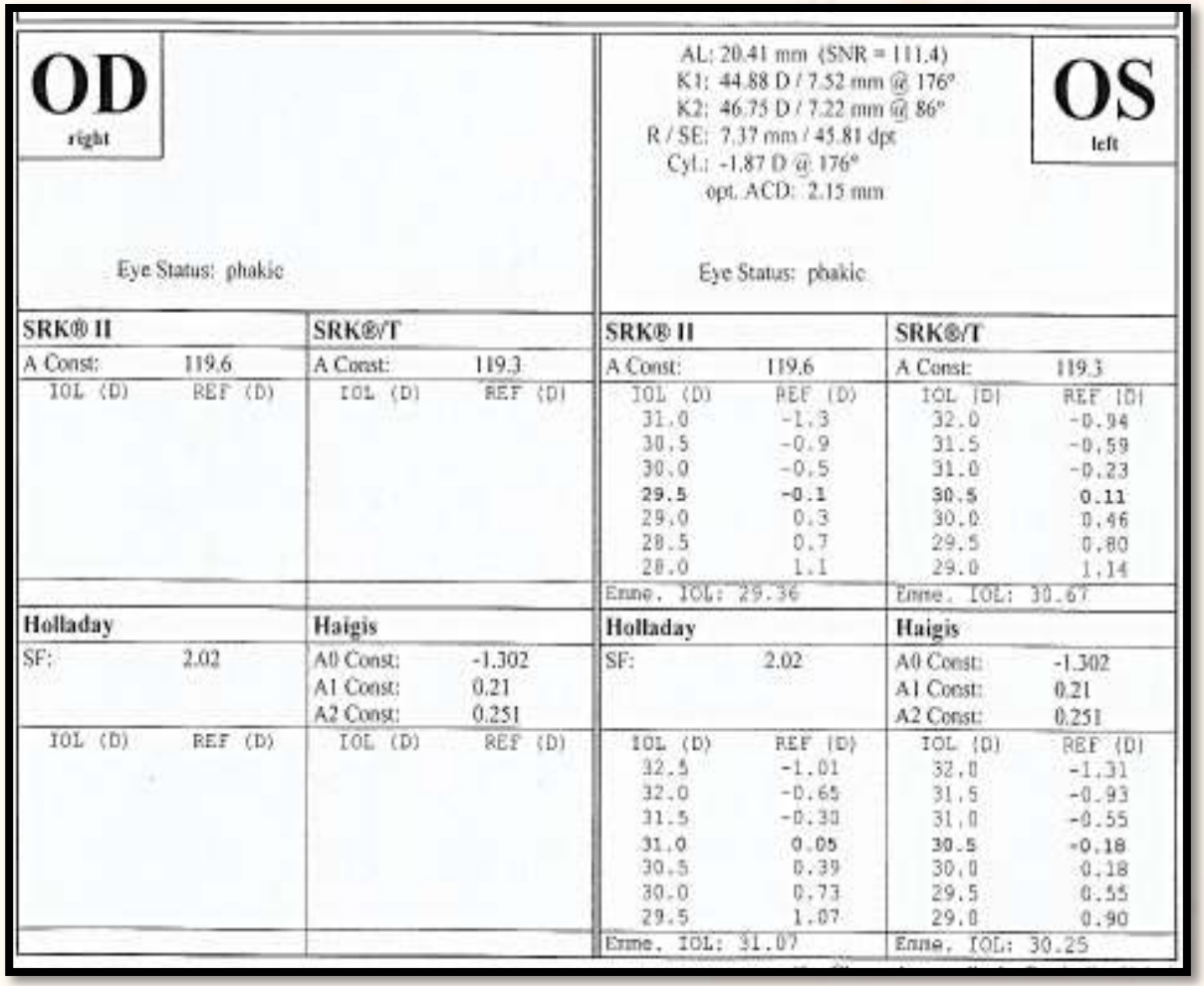
Status: Phakic

| SRK®/T | | SRK® II | |
|---|---|---|---|
| A const: | 119.20 | A const: | 119.60 |
| IOL (D) | REF (D) | IOL (D) | REF (D) |

| SRK®/T | | SRK® II | |
|---|---|---|---|
| A const: | 119.30 | A const: | 119.60 |
| IOL (D) | REF (D) | IOL (D) | REF (D) |
| 31.0 | -1.00 | 30.0 | -1.7 |
| 30.5 | -0.63 | 29.5 | -1.3 |
| 30.0 | -0.29 | 29.0 | -0.9 |
| 29.5 | 0.08 | 28.5 | 0.2 |
| 29.0 | 0.43 | 28.0 | 0.2 |
| 28.5 | 0.79 | 27.5 | 0.6 |
| 28.0 | 1.13 | 27.0 | 1.0 |
| Emme. IOL: 29.62 | | Franc. IOL: 29.50 | |

| Haigis | | Holladay 1 | |
|---|---|---|---|
| A0 const: | -1.302 | SF: | 2.02 |
| A1 const: | 0.210 | | |
| A2 const: | 0.251 | | |
| IOL (D) | REF (D) | IOL (D) | REF (D) |

| Haigis | | Holladay 1 | |
|---|---|---|---|
| A0 const: | -1.302 | SF | 2.02 |
| A1 const: | 0.210 | | |
| A2 const: | 0.251 | | |
| IOL (D) | REF (D) | IOL (D) | REF (D) |
| 32.0 | -1.15 | 31.5 | -0.94 |
| 31.5 | -0.79 | 31.0 | -0.58 |
| 31.0 | -0.41 | 30.5 | -0.23 |
| 30.5 | -0.05 | 30.0 | 0.12 |
| 30.0 | 0.31 | 29.5 | 0.47 |
| 29.5 | 0.67 | 29.0 | 0.81 |
| 29.0 | 1.02 | 28.5 | 1.15 |
| Emme. IOL: 30.44 | | Emme. IOL: 30.17 | |



**OD** right

Eye Status: phakic

**OS** left

AL: 20.41 mm (SNR = 111.4)
K1: 44.88 D / 7.52 mm @ 176°
K2: 46.75 D / 7.22 mm @ 86°
R / SE: 7.37 mm / 45.81 dpt
Cyl.: -1.87 D @ 176°
opt. ACD: 2.15 mm

Eye Status: phakic

| SRK® II | | SRK®/T | |
|---|---|---|---|
| A Const: | 119.6 | A Const: | 119.3 |
| IOL (D) | REF (D) | IOL (D) | REF (D) |

| SRK® II | | SRK®/T | |
|---|---|---|---|
| A Const: | 119.6 | A Const: | 119.3 |
| IOL (D) | REF (D) | IOL (D) | REF (D) |
| 31.0 | -1.3 | 32.0 | -0.94 |
| 30.5 | -0.9 | 31.5 | -0.59 |
| 30.0 | -0.5 | 31.0 | -0.23 |
| 29.5 | -0.1 | 30.5 | 0.11 |
| 29.0 | 0.3 | 30.0 | 0.46 |
| 28.5 | 0.7 | 29.5 | 0.80 |
| 28.0 | 1.1 | 29.0 | 1.14 |
| Emme. IOL: 29.36 | | Emme. IOL: 30.67 | |

| Holladay | | Haigis | |
|---|---|---|---|
| SF: | 2.02 | A0 Const: | -1.302 |
| | | A1 Const: | 0.21 |
| | | A2 Const: | 0.251 |
| IOL (D) | REF (D) | IOL (D) | REF (D) |

| Holladay | | Haigis | |
|---|---|---|---|
| SF: | 2.02 | A0 Const: | -1.302 |
| | | A1 Const: | 0.21 |
| | | A2 Const: | 0.251 |
| IOL (D) | REF (D) | IOL (D) | REF (D) |
| 32.5 | -1.01 | 32.0 | -1.31 |
| 32.0 | -0.65 | 31.5 | -0.93 |
| 31.5 | -0.30 | 31.0 | -0.55 |
| 31.0 | 0.05 | 30.5 | -0.18 |
| 30.5 | 0.39 | 30.0 | 0.18 |
| 30.0 | 0.73 | 29.5 | 0.55 |
| 29.5 | 1.07 | 29.0 | 0.90 |
| Emme. IOL: 31.07 | | Emme. IOL: 30.25 | |

# Do you depend on the biometry?

**OD** right

AL: 18.45 mm (SNR = 360.1)
K1: 46.17 D / 7.31 mm @ 27°
K2: 47.67 D / 7.08 mm @ 117°
R / SE: 7.20 mm / 46.92 dpt
Cyl.: -1.50 D @ 27°
opt. ACD: 2.90 mm

Eye Status: phakic

| SRK® II | | SRK®/T | |
|---|---|---|---|
| A Const: | 118 | A Const: | 118 |
| IOL (D) | REF (D) | IOL (D) | REF (D) |
| 34.0 | -1.1 | 37.0 | -1.14 |
| 33.5 | -0.7 | 36.5 | -0.75 |
| 33.0 | -0.3 | 36.0 | -0.36 |
| **32.5** | **0.1** | **35.5** | **0.02** |
| 32.0 | 0.5 | 35.0 | 0.40 |
| 31.5 | 0.9 | 34.5 | 0.78 |
| 31.0 | 1.3 | 34.0 | 1.15 |
| Emme. IOL: 32.66 | | Emme. IOL: 35.53 | |
| **Holladay** | | **HofferQ** | |
| SF: | 1.22 | pACD Const: | 4.96 |
| IOL (D) | REF (D) | IOL (D) | REF (D) |
| 38.0 | -1.31 | 39.5 | -1.0 |
| 37.5 | -0.92 | 39.0 | -0.6 |
| 37.0 | -0.53 | 38.5 | -0.3 |
| **36.5** | **-0.15** | **38.0** | **0.1** |
| 36.0 | 0.23 | 37.5 | 0.5 |
| 35.5 | 0.60 | 37.0 | 0.8 |
| 35.0 | 0.97 | 36.5 | 1.2 |
| Emme. IOL: 36.30 | | Emme. IOL: 38.13 | |

AL: 18.47 mm (SNR = 264.0)
K1: 45.73 D / 7.38 mm @ 143°
K2: 46.94 D / 7.19 mm @ 53°
R / SE: 7.29 mm / 46.33 dpt
Cyl.: -1.21 D @ 143°
opt. ACD: 2.92 mm

**OS** left

Eye Status: phakic

| SRK® II | | SRK®/T | |
|---|---|---|---|
| A Const: | 118 | A Const: | 118 |
| IOL (D) | REF (D) | IOL (D) | REF (D) |
| 34.5 | -1.1 | 37.5 | -1.21 |
| 34.0 | -0.7 | 37.0 | -0.82 |
| 33.5 | -0.3 | 36.5 | -0.42 |
| **33.0** | **0.1** | **36.0** | **-0.04** |
| 32.5 | 0.5 | 35.5 | 0.35 |
| 32.0 | 0.9 | 35.0 | 0.73 |
| 31.5 | 1.3 | 34.5 | 1.10 |
| Emme. IOL: 33.13 | | Emme. IOL: 35.95 | |
| **Holladay** | | **HofferQ** | |
| SF: | 1.22 | pACD Const: | 4.96 |
| IOL (D) | REF (D) | IOL (D) | REF (D) |
| 38.5 | -1.30 | 40.0 | -1.1 |
| 38.0 | -0.91 | 39.5 | -0.7 |
| 37.5 | -0.52 | 39.0 | -0.3 |
| **37.0** | **-0.13** | **38.5** | **0.1** |
| 36.5 | 0.25 | 38.0 | 0.4 |
| 36.0 | 0.63 | 37.5 | 0.8 |
| 35.5 | 1.00 | 37.0 | 1.2 |
| Emme. IOL: 36.83 | | Emme. IOL: 38.59 | |

**OD** right

AL: 20.55 mm (*)
K1: 42.94 D / 7.86 mm @ 74°
K2: 45.98 D / 7.34 mm @ 164°
R / SE: 7.60 mm / 44.46 D
Cyl.: -3.04 D @ 74°
ACD: 3.14 mm
Refraction: 0 D 0 D @ 0°

Status: Phakic

| SRK®/T | | SRK® II | |
|---|---|---|---|
| A const: | 119.30 | A const: | 119.60 |
| IOL (D) | REF (D) | IOL (D) | REF (D) |
| 33.0 | -1.13 | 32.0 | -1.4 |
| 32.5 | -0.76 | 31.5 | -1.0 |
| 32.0 | -0.40 | 31.0 | -0.6 |
| **31.5** | **-0.04** | **30.5** | **-0.2** |
| 31.0 | 0.31 | 30.0 | 0.2 |
| 30.5 | 0.66 | 29.5 | 0.6 |
| 30.0 | 1.01 | 29.0 | 1.0 |
| Emme. IOL: 31.44 | | Emme. IOL: 30.26 | |
| **Haigis** | | **Holladay 1** | |
| A0 const: | -1.302 | SF: | 2.02 |
| A1 const: | 0.210 | | |
| A2 const: | 0.251 | | |
| IOL (D) | REF (D) | IOL (D) | REF (D) |
| 33.5 | -0.99 | 33.5 | -1.03 |
| 33.0 | -0.62 | 33.0 | -0.67 |
| 32.5 | -0.25 | 32.5 | -0.31 |
| **32.0** | **0.12** | **32.0** | **0.04** |
| 31.5 | 0.48 | 31.5 | 0.39 |
| 31.0 | 0.83 | 31.0 | 0.74 |
| 30.5 | 1.18 | 30.5 | 1.08 |
| Emme. IOL: 32.16 | | Emme. IOL: 32.06 | |

**OS** left

Refraction: 0 D 0 D @ 0°

Status: Phakic

| SRK®/T | | SRK® II | |
|---|---|---|---|
| A const: | 119.30 | A const: | 119.60 |
| IOL (D) | REF (D) | IOL (D) | REF (D) |
| **Haigis** | | **Holladay 1** | |
| A0 const: | -1.302 | SF: | 2.02 |
| A1 const: | 0.210 | | |
| A2 const: | 0.251 | | |
| IOL (D) | REF (D) | IOL (D) | REF (D) |

EOS 2025
EGYPTIAN OPHTHALMOLOGICAL SOCIETY

# Anatomic Classification

- **Short AC depth with short axial length**
  - Nanophthalmos (simple microphthalmos)
  - Colobomatous microphthalmos
  - Complex microphthalmos
- **Short AC depth with normal axial length**
  - Relative anterior microphthalmos
- **Normal AC depth with short axial length**
  - Axial hyperopia

# Nanophthalmos

**Axial length less than 20.5 mm (average 17.0 mm)**

**Average refraction + 13.5 D**

**Associated with PXF and glaucoma**

# Nanophthalmos

A- Short axial length

B- Small cornea

C- Shallow AC

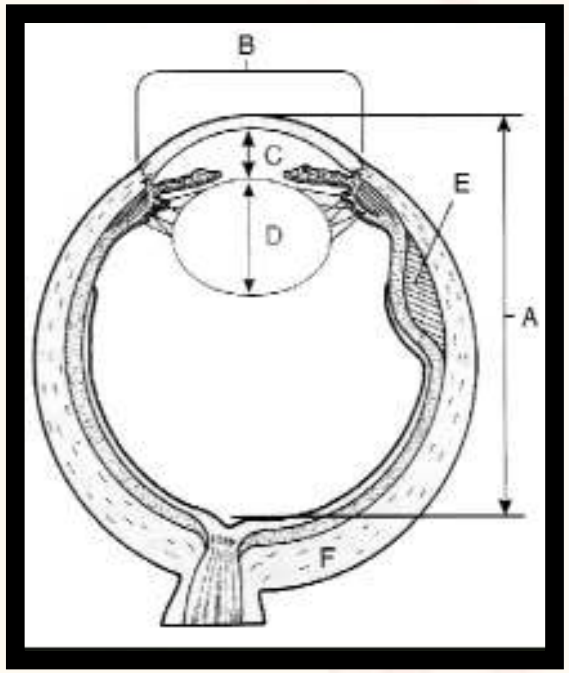
marked iris convexity

D- Normal / Increased lens thickness

E- Uveal effusions

F- Thickened sclera

Thickened choroid

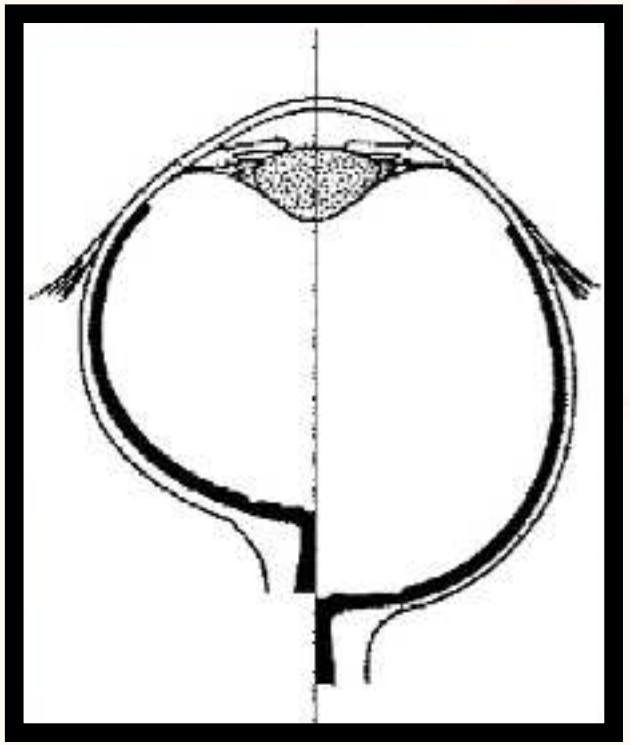


# Relative Anterior Microphthalmos
# Short AC depth / Normal Axial Length

- More common than nanophthalmos
- High incidence of narrow angle glaucoma
- High incidence of cornea guttata and pseudoexfoliation
- No scleral abnormalities
- No uveal effusions

# Axial Hyperopia
# Normal AC / Short Axial Length

- Most hyperopes are in this category (83%)
- High hyperopia
- No complications



# Preoperatively

**It is important to categorize the high hypermetropic patient in one of the three groups**

# The Challenge:

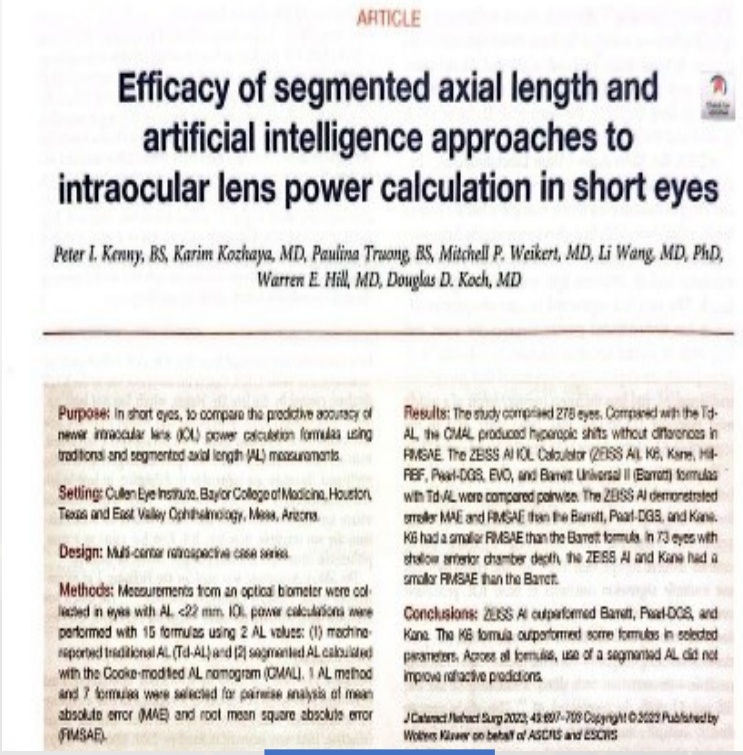
**The Nanophthalmic eye**

# Biometry

- A real challenge
- Optical biometry or Immersion biometry
- Any minor error in axial length determination will lead to large refractive error

# Biometry in Short eyes
# A unique challenge

-Only 60% to 71% fall within 0.5 diopter of the refractive target post-operatively.[1]
-one major error source is physical optics. The higher IOL power and smaller lens-retina distance amplify refractive sensitivity to an ELP as much as 5-fold.[2]
-The shape factor of IOLs is an increasingly significant and non uniform source of error at higher IOL powers. [3]



ARTICLE

Efficacy of segmented axial length and artificial intelligence approaches to intraocular lens power calculation in short eyes

*Peter I. Kenny, BS, Karim Kozhaya, MD, Paulina Truong, BS, Mitchell P. Weikert, MD, Li Wang, MD, PhD, Warren E. Hill, MD, Douglas D. Koch, MD*

**Purpose:** In short eyes, to compare the predictive accuracy of newer intraocular lens (IOL) power calculation formulas using traditional and segmented axial length (AL) measurements.

**Setting:** Cullen Eye Institute, Baylor College of Medicine, Houston, Texas and East Valley Ophthalmology, Mesa, Arizona.

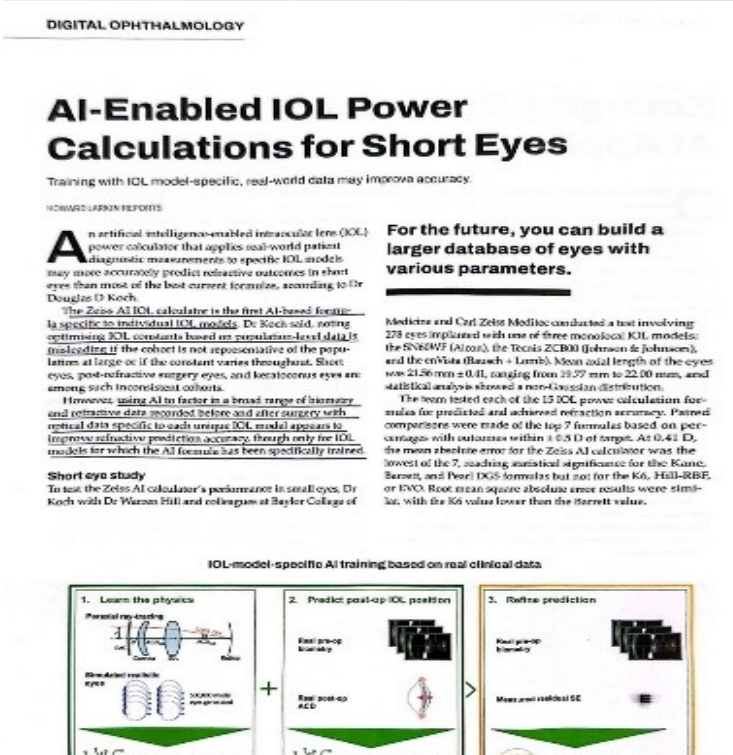
**Design:** Multi-center retrospective case series.

**Methods:** Measurements from an optical biometer were collected in eyes with AL <22 mm. IOL power calculations were performed with 15 formulas using 2 AL values: (1) machine-reported traditional AL (Td-AL) and (2) segmented AL calculated with the Cooke-modified AL nomogram (CMAL). 1 AL method and 7 formulas were selected for pairwise analysis of mean absolute error (MAE) and root mean square absolute error (RMSAE).

**Results:** The study comprised 276 eyes. Compared with the Td-AL, the CMAL produced hyperopic shifts without differences in RMSAE. The ZEISS AI IOL Calculator (ZEISS AI, K6, Kane, Hill-RBF, Pearl-DGS, EVO, and Barrett Universal II (Barrett) formulas with Td-AL were compared pairwise. The ZEISS AI demonstrated smaller MAE and RMSAE than the Barrett, Pearl-DGS, and Kane. K6 had a smaller RMSAE than the Barrett formula. In 73 eyes with shallow anterior chamber depth, the ZEISS AI and Kane had a smaller RMSAE than the Barrett.

**Conclusions:** ZEISS AI outperformed Barrett, Pearl-DGS, and Kane. The K6 formula outperformed some formulas in selected parameters. Across all formulas, use of a segmented AL did not improve refractive predictions.

J Cataract Refract Surg 2023; 49:697–705 



DIGITAL OPHTHALMOLOGY

AI-Enabled IOL Power Calculations for Short Eyes

Training with IOL model-specific, real-world data may improve accuracy

HOWARD LARKIN REPORTS

An artificial intelligence-enabled intraocular lens (IOL) power calculator that applies real-world patient diagnostic measurements to specific IOL models may more accurately predict refractive outcomes in short eyes than most of the best current formulas, according to Dr Douglas D Koch.

The Zeiss AI IOL calculator is the first AI-based formula specific to individual IOL models, Dr Koch said, noting optimising IOL constants based on population-level data is misleading if the cohort is not representative of the population at large or if the constant varies throughout. Short eyes, post-refractive surgery eyes, and keratoconus eyes are among such inconsistent cohorts.

However, using AI to factor in a broad range of biometry and refractive data recorded before and after surgery with optical data specific to each unique IOL model appears to improve refractive prediction accuracy, though only for IOL models for which the AI formula has been specifically trained.

**Short eye study**

To test the Zeiss AI calculator's performance in small eyes, Dr Koch with Dr Warren Hill and colleagues at Baylor College of Medicine and Carl Zeiss Meditec conducted a test involving 278 eyes implanted with one of three monofocal IOL models: the SN60WF (Alcon), the Tecnis ZCB00 (Johnson & Johnson), and the enVista (Bausch + Lomb). Mean axial length of the eyes was 21.56 mm ± 0.41, ranging from 19.97 mm to 22.00 mm, and statistical analysis showed a non-Gaussian distribution.

The team tested each of the 15 IOL power calculation formulas for predicted and achieved refraction accuracy. Paired comparisons were made of the top 7 formulas based on percentages with outcomes within ± 0.5 D of target. At 0.41 D, the mean absolute error for the Zeiss AI calculator was the lowest of the 7, reaching statistical significance for the Kane, Barrett, and Pearl DGS formulas but not for the K6, Hill-RBF, or EVO. Root mean square absolute error results were similar, with the K6 value lower than the Barrett value.

**For the future, you can build a larger database of eyes with various parameters.**

IOL-model-specific AI training based on real clinical data



2024

1- Luo etal. Opthalmol 2022;42:1939-1956

2-Olsen T. Acta OpthalmolScand 2007;85:472-485

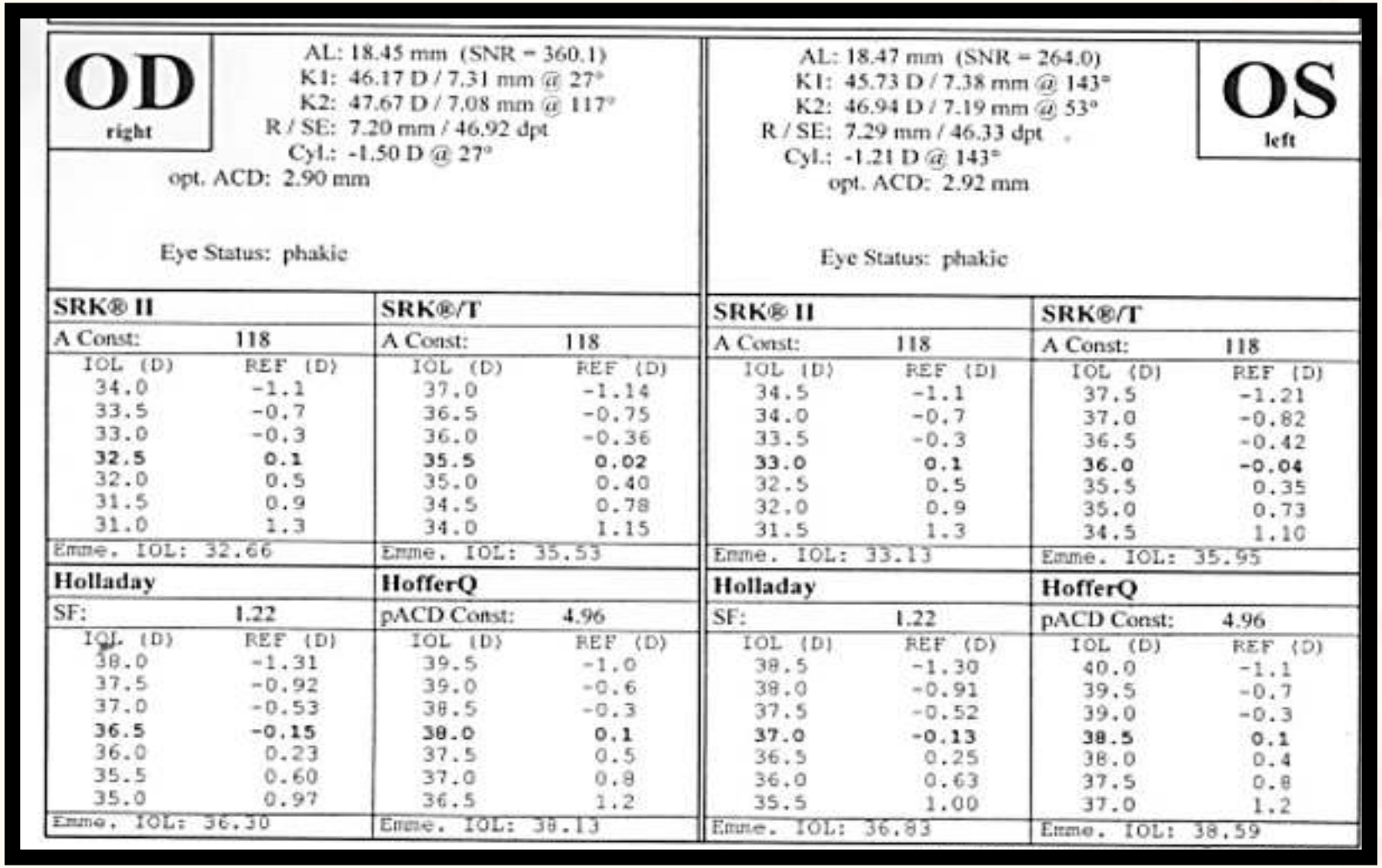
3-Farsa Koglu etal .Optica publishing 2014;928-902.

# Biometry in Short eyes
# A unique challenge

## The Solution

- Use SOS devices
- AI enabled formulas

# Biometry can be surprising



**OD** right

AL: 18.45 mm (SNR = 360.1)
K1: 46.17 D / 7.31 mm @ 27°
K2: 47.67 D / 7.08 mm @ 117°
R / SE: 7.20 mm / 46.92 dpt
Cyl.: -1.50 D @ 27°
opt. ACD: 2.90 mm

Eye Status: phakic

| SRK® II | | SRK®/T | |
|---|---|---|---|
| A Const: | 118 | A Const: | 118 |
| IOL (D) | REF (D) | IOL (D) | REF (D) |
| 34.0 | -1.1 | 37.0 | -1.14 |
| 33.5 | -0.7 | 36.5 | -0.75 |
| 33.0 | -0.3 | 36.0 | -0.36 |
| **32.5** | **0.1** | **35.5** | **0.02** |
| 32.0 | 0.5 | 35.0 | 0.40 |
| 31.5 | 0.9 | 34.5 | 0.78 |
| 31.0 | 1.3 | 34.0 | 1.15 |
| Emme. IOL: 32.66 | | Emme. IOL: 35.53 | |

| Holladay | | HofferQ | |
|---|---|---|---|
| SF: | 1.22 | pACD Const: | 4.96 |
| IOL (D) | REF (D) | IOL (D) | REF (D) |
| 38.0 | -1.31 | 39.5 | -1.0 |
| 37.5 | -0.92 | 39.0 | -0.6 |
| 37.0 | -0.53 | 38.5 | -0.3 |
| **36.5** | **-0.15** | **38.0** | **0.1** |
| 36.0 | 0.23 | 37.5 | 0.5 |
| 35.5 | 0.60 | 37.0 | 0.8 |
| 35.0 | 0.97 | 36.5 | 1.2 |
| Emme. IOL: 36.30 | | Emme. IOL: 38.13 | |

AL: 18.47 mm (SNR = 264.0)
K1: 45.73 D / 7.38 mm @ 143°
K2: 46.94 D / 7.19 mm @ 53°
R / SE: 7.29 mm / 46.33 dpt
Cyl.: -1.21 D @ 143°
opt. ACD: 2.92 mm

**OS** left

Eye Status: phakic

| SRK® II | | SRK®/T | |
|---|---|---|---|
| A Const: | 118 | A Const: | 118 |
| IOL (D) | REF (D) | IOL (D) | REF (D) |
| 34.5 | -1.1 | 37.5 | -1.21 |
| 34.0 | -0.7 | 37.0 | -0.82 |
| 33.5 | -0.3 | 36.5 | -0.42 |
| **33.0** | **0.1** | **36.0** | **-0.04** |
| 32.5 | 0.5 | 35.5 | 0.35 |
| 32.0 | 0.9 | 35.0 | 0.73 |
| 31.5 | 1.3 | 34.5 | 1.10 |
| Emme. IOL: 33.13 | | Emme. IOL: 35.95 | |

| Holladay | | HofferQ | |
|---|---|---|---|
| SF: | 1.22 | pACD Const: | 4.96 |
| IOL (D) | REF (D) | IOL (D) | REF (D) |
| 38.5 | -1.30 | 40.0 | -1.1 |
| 38.0 | -0.91 | 39.5 | -0.7 |
| 37.5 | -0.52 | 39.0 | -0.3 |
| **37.0** | **-0.13** | **38.5** | **0.1** |
| 36.5 | 0.25 | 38.0 | 0.4 |
| 36.0 | 0.63 | 37.5 | 0.8 |
| 35.5 | 1.00 | 37.0 | 1.2 |
| Emme. IOL: 36.83 | | Emme. IOL: 38.59 | |

# Biometry (IOL Master)

- Axl 16.81 16.6
- ACD 3.18 3.21
- Ker
  - $k_1$ 50.15 $k_1$ 49.56
  - $k_2$ 50.30 $k_2$ 50.75

# Results of IOL Master

| Lt | | Rt | | |
|---|---|---|---|---|
| Aqua Sense | Corneal | Aqua Sense | Corneal | |
| +47 | +56.5 | +45.5 | +54 | Haigis |
| +60 | +60 | +48 | +57.5 | Hoffer Q |
| +31 | +37.5 | +34 | +37 | SRK II |

# What type of IOL would you use in such a case ?

# Polypseudophakia
# Piggyback IOLs

**The implantation of 2 or more posterior chamber IOLs was introduced by Gayton and Sanders in 1993**

# Piggyback IOLs

## What material for the IOL




# IOL material

- One acrylic in the bag + silicone in the sulcus
  - Avoid the acrylic – acrylic surface interaction
  - Keeping the most biocompatible against the capsule
  - The three piece IOL anteriorly in the sulcus

# Piggyback IOLs

**Preferred site for implantation?**

- 2 in the bag

- bag / sulcus

- 2 in the sulcus

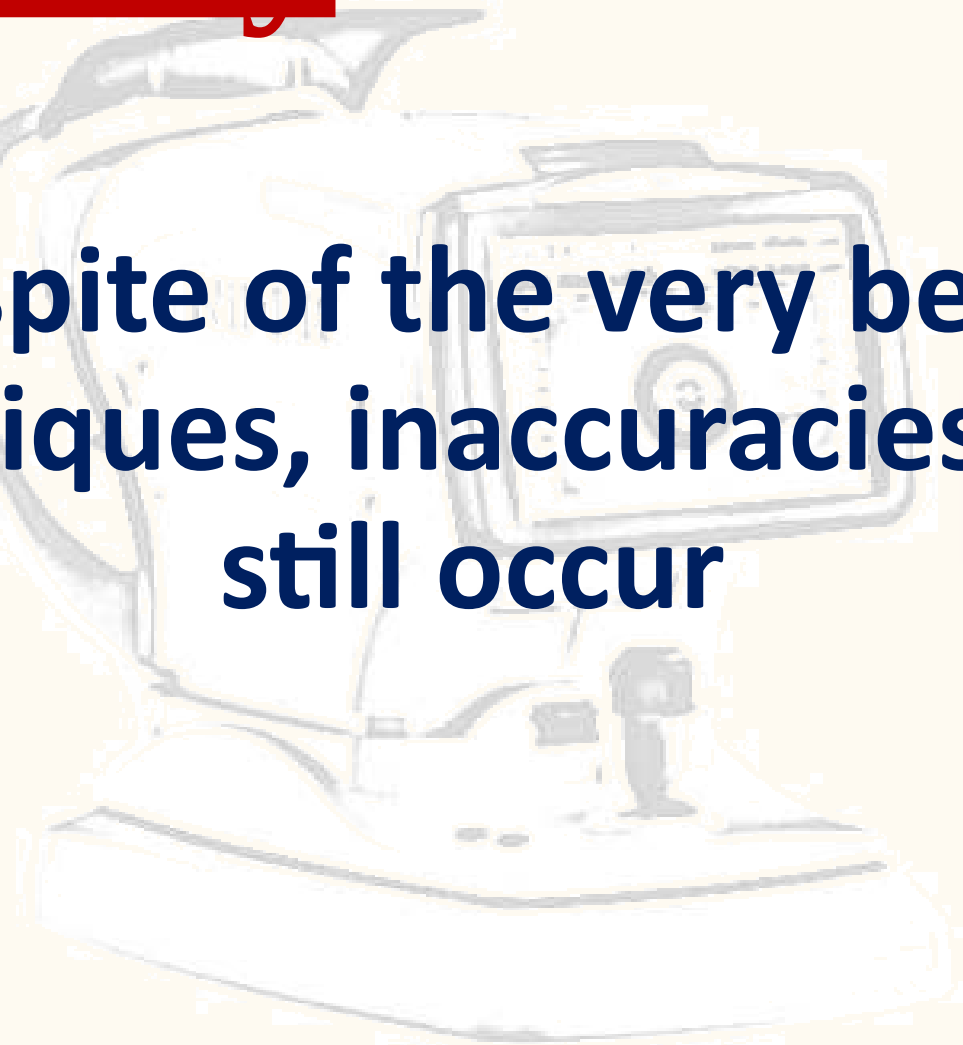
# Prevention of ILO

1. Careful cortical cleanup removing most equatorial cells.

2. Performing a CCC larger than the IOL optic.

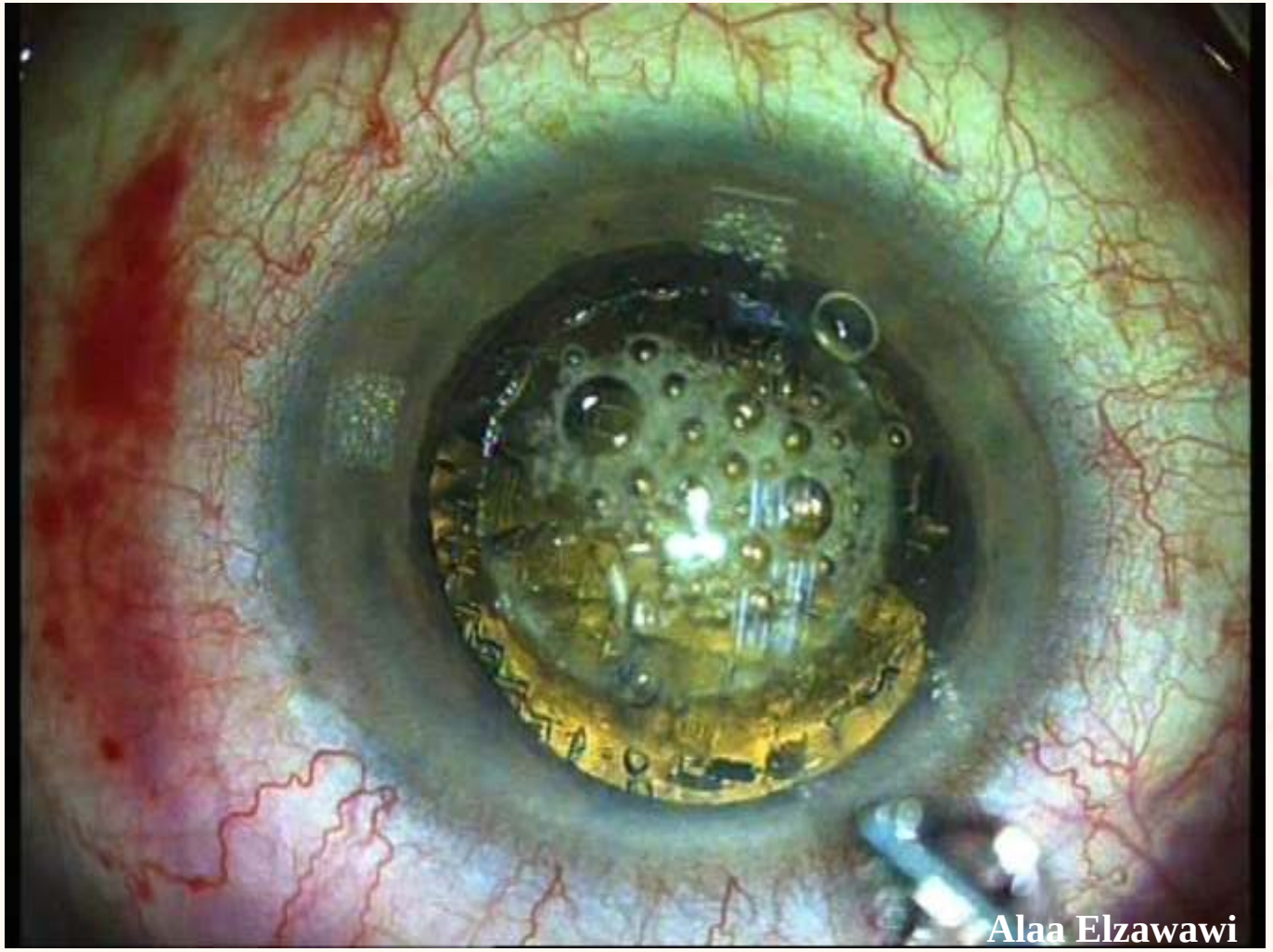
3. One IOL in the bag and the other in the sulcus.

# Biometry



**In spite of the very best techniques, inaccuracies may still occur**

# Femto rhexis



# Analyze

**OS**
left

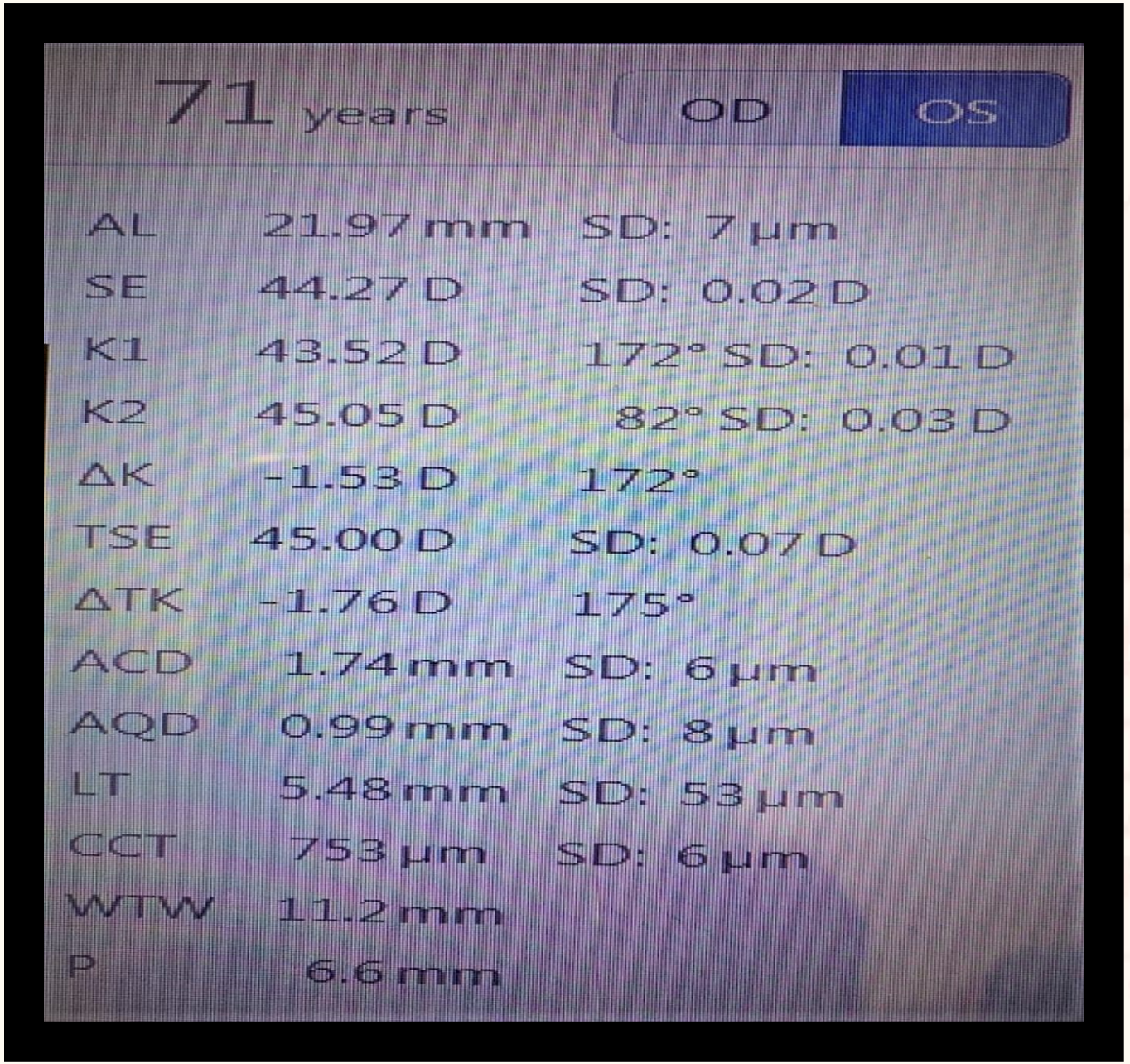
## Eye status

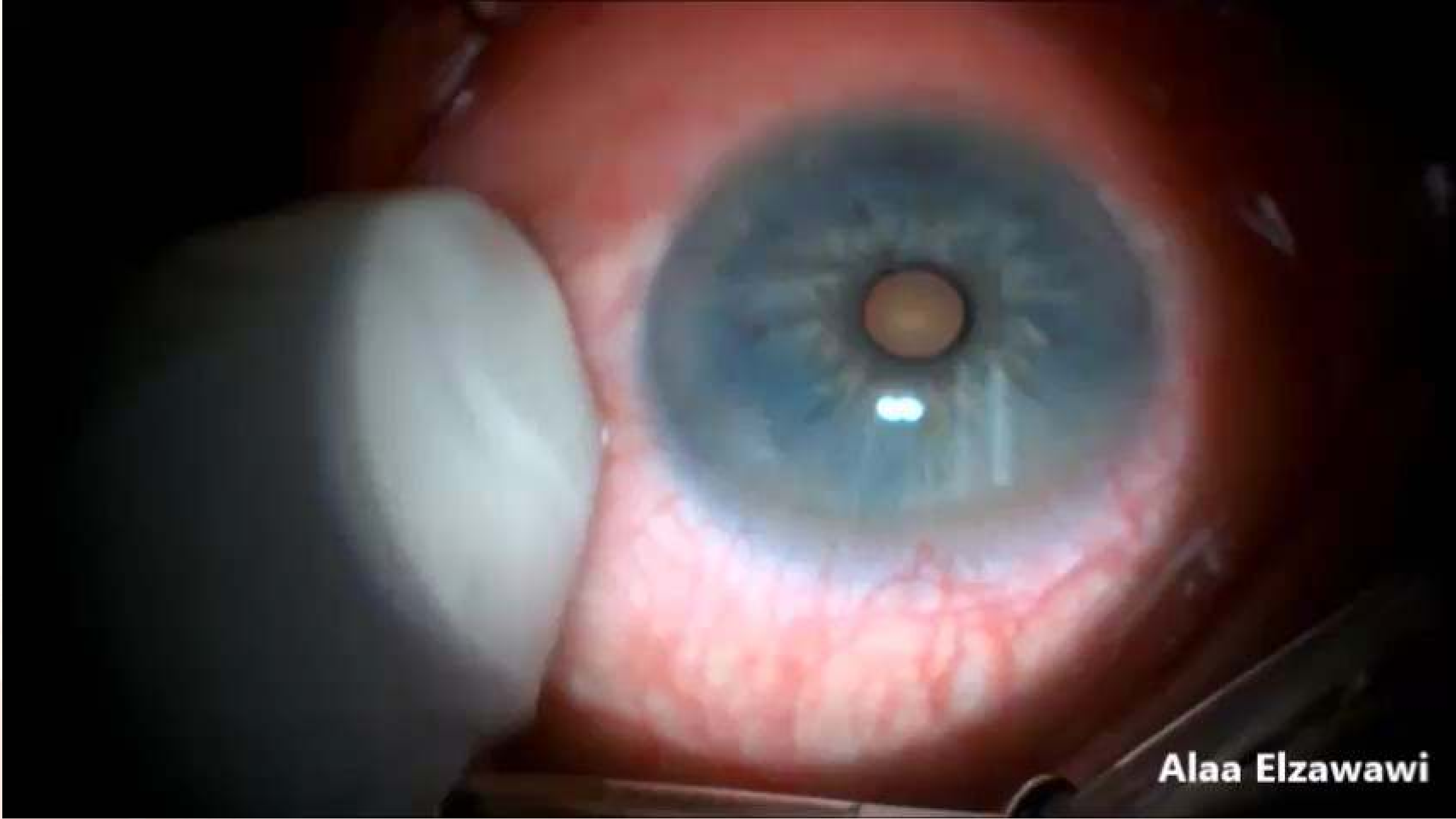
| | | | | | |
|---|---|---|---|---|---|
| LS: | Phakic | VS: | Vitreous body | LVC: | Untreated |
| Ref: | --- | VA: | --- | | |

## Biometric values

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| AL: | 21.97 mm | SD: | 12 µm | WTW: | 11.3 mm | Ix: | -0.6 mm Iy: +0.4 mm |
| CCT: | 759 µm (!) | SD: | 7 µm | P: | 6.6 mm | CW-Chord: | 0.4 mm @ 312° |
| ACD: | 1.75 mm | SD: | 6 µm | | | | |
| LT: | 5.53 mm (!) | SD: | 65 µm | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SE: | 44.34 D (!) | SD: | 0.02 D | TSE: | 45.07 D (!) | SD: | 0.02 D |
| K1: | 43.63 D @ 174° | SD: | 0.02 D | TK1: | 44.26 D @ 178° | SD: | 0.09 D |
| K2: | 45.07 D @ 84° | SD: | 0.03 D | TK2: | 45.90 D @ 88° | SD: | 0.04 D |
| ΔK: | -1.45 D @ 174° | | | ΔTK: | -1.64 D @ 178° | | |


71 years
OD
OS
AL 21.97 mm SD: 7 µm
SE 44.27 D SD: 0.02 D
K1 43.52 D 172° SD: 0.01 D
K2 45.05 D 82° SD: 0.03 D
ΔK -1.53 D 172°
TSE 45.00 D SD: 0.07 D
ΔTK -1.76 D 175°
ACD 1.74 mm SD: 6 µm
AQD 0.99 mm SD: 8 µm
LT 5.48 mm SD: 53 µm
CCT 753 µm SD: 6 µm
WTW 11.2 mm
P 6.6 mm


Alaa Elzawawi


Thank You