



Cataract Surgery Considerations in the Keratoconus Patient

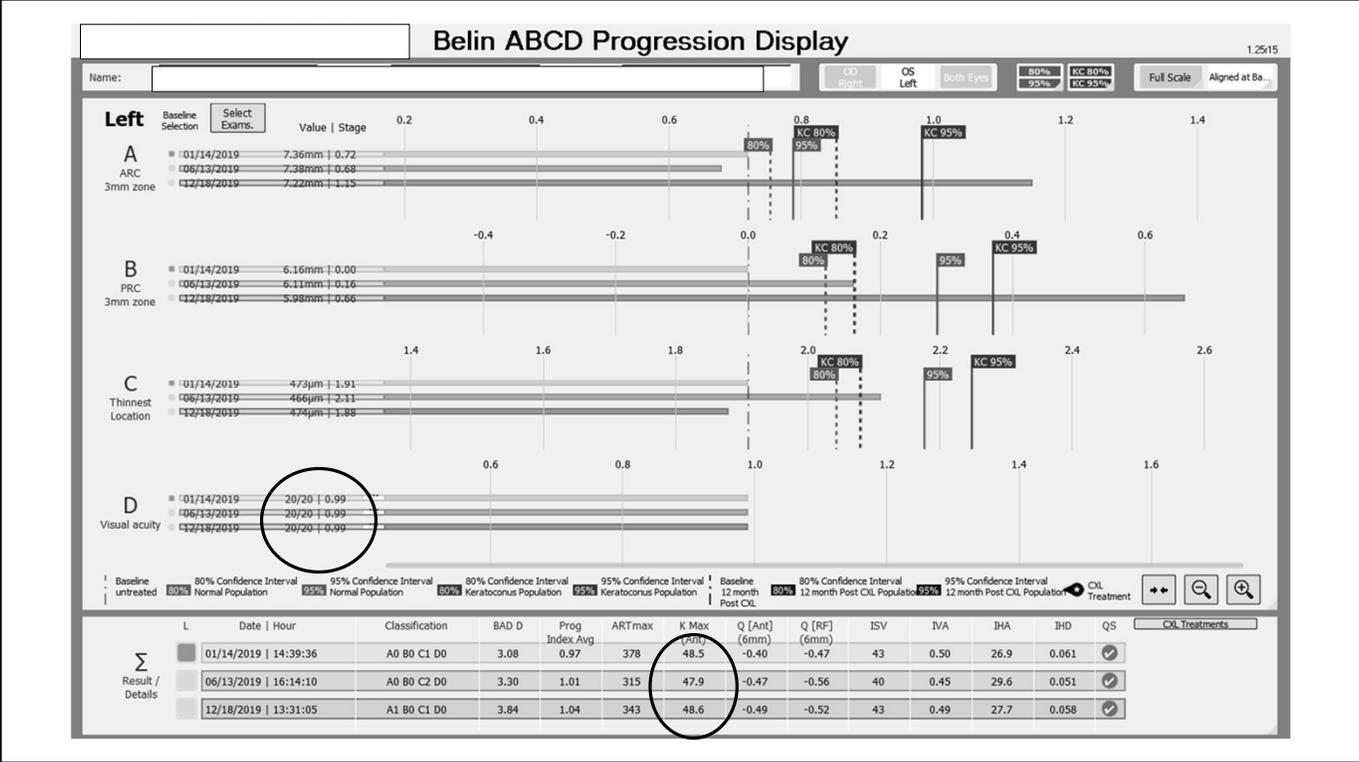
Clark Chang, OD, MS, FAAO, FSLs
(Special Thanks to Brandon D. Ayres, MD)
Cornea Service



Financial Disclosure: Clark Y. Chang, OD, MS, FAAO, FSLs

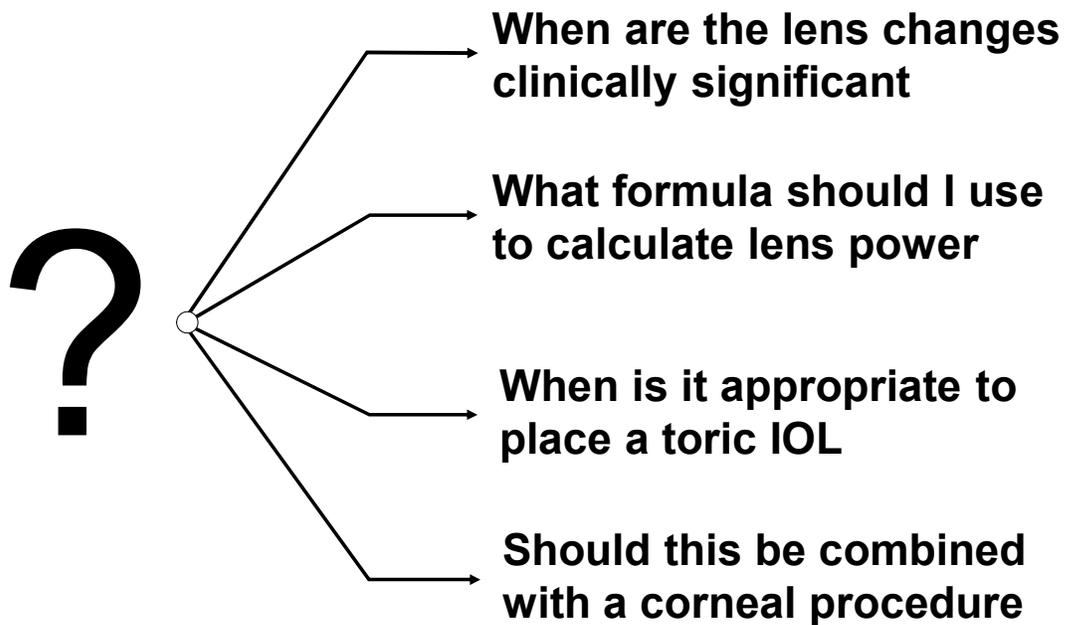
- EssilorLuxottica (Sr. Director, Medical & Surgical Operations)
- Oculus
- Wills Eye Hospital (Director of Specialty CL, Cornea Service)

The opinions expressed in this presentation are my own and do not represent the views of my employers



Much of the focus with Keratoconus is on the younger patients & prevention of progression...and rightfully so

But eventually keratoconus patients will develop cataracts and need cataract surgery

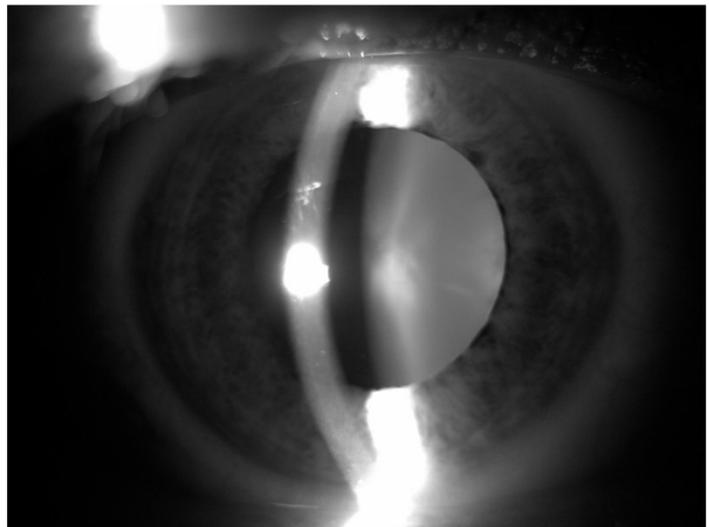


Determination of clinically significant lens changes

Clinical Significance

Overlaps of symptoms **KCN vs Cataract**

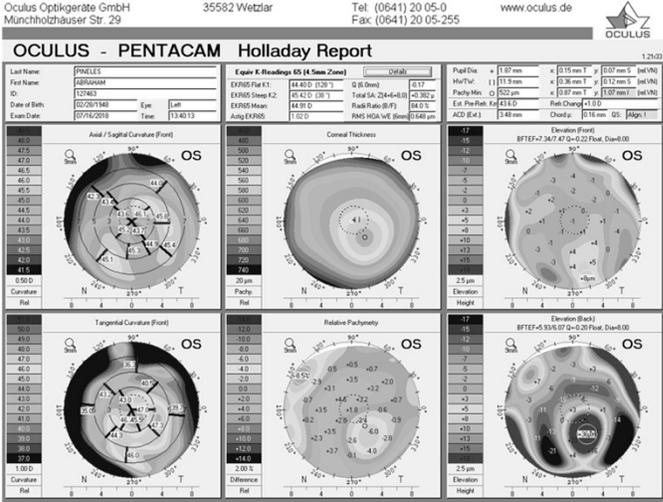
- Reduced vision - corrected and uncorrected VA
- Glare & Haloes
- Difficulty reading



Clinical Significance

Establish Corneal Stability

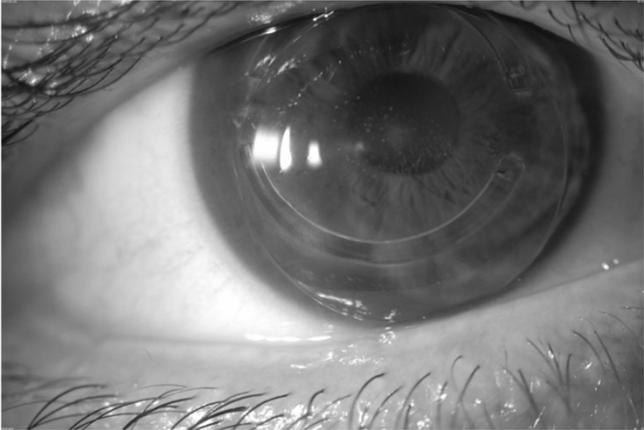
- Stable corneal Topography/Tomography
 - If not stable over time, need to consider slow or halt progression
 - Make sure patient is out of CLs before cataract evaluation (or pre-IOL planning)
- Change in MRx over time is not accompanied by any changes in corneal parameters



Clinical Significance

Look at the Cornea

- RGP contact lens refraction can help determine changes in the corneal component from lenticular changes/opacity
- Significant scarring or hydrops may be the etiology for reduced vision
- In some cases, the cornea and the lens may both be limiting vision



Calculation of Lens Power

Biometry in the Keratoconic Patient

- Multiple challenges for axial length and keratometry
 - Fixation challenges
 - Variability in keratometric values increase with more advanced keratoconus (K's > 55.0)
- Slight advantage noted in Scheimpflug systems with more advanced keratoconus
- Placido topographers also show an increase in variability with keratoconus patients



Hashemi H, Yekta A, Khabazkhoob M. Effect of keratoconus grades on repeatability of keratometry readings: Comparison of 5 devices. J Cataract Refract Surg. 2015 May;41(5):1065-72.

Guilbert E, Saad A, Elluard M, Grise-Dulac A, Rouger H, Gatineau D. Repeatability of Keratometry Measurements Obtained With Three Topographers in Keratoconic and Normal Corneas. J Refract Surg. 2016 Mar;32(3):187-92.

Biometry in the Keratoconic Patient

- No real consensus as to which IOL formula may be preferred
- Confounding variables include steep apical cornea, change in the anterior/posterior corneal curvature, deep anterior chamber
- In one small series SRK II was the preferred method for mild KC (compared SRK, SRK II, and SRK/T)
- In other series with more modern generation formulas (Barrett univ II, Holladay I, SRK/T, Hoffer Q), the SRK/T was most accurate
- Barrett True-K for Keratoconus and Kane Formula now are the preferred modern generation formulas
- Many of the formulas will leave the patient hyperopic due to overestimation of the corneal power (steep central K)
- In some cases K values will have to be estimated with the assumption that a PKP may be performed in the future

OS: Keratometry value is uncertain.

OD		IOL calculation (Multifactorial)		OS	
right					left
AL: 24.28 mm (SD + 8 µm)	WTV: 12.1 mm	AL: 24.53 mm (SD + 5 µm)	WTV: 12.3 mm		
ACD: 2.87 mm (SD + 6 µm)		ACD: 3.98 mm (SD + 6 µm)			
LT: 4.82 mm (SD + 15 µm)		LT: 4.85 mm (SD + 11 µm)			
SE: 41.78 D		SE: 41.98 D			
K1: 41.28 D @ 138°	ΔD: +1.01 D @ 48°	K1: 40.79 D @ 15°	ΔD: +1.63 D @ 105°		
	K2: 42.27 D @ 48°		K2: 42.42 D @ 105°		
Ref: ---	VA: ---	Ref: ---	VA: ---		
Target ref: plano	SIA: +0.00 D @ 0°	Target ref: plano	SIA: +0.00 D @ 0°		
LS: Phakic; VS: Vitreous body; LVC: Unrestrained; LVC mode: ---		LS: Phakic; VS: Vitreous body; LVC: Unrestrained; LVC mode: ---			
SRK/T		Hoffer@Q		SRK/T	
A const: 119.10		pACD: +5.61		A const: 119.10	
IOL (D)	Ref (D)	IOL (D)	Ref (D)	IOL (D)	Ref (D)
+22.00	-0.77	+22.00	-0.91	+21.50	-0.86
+21.50	-0.42	+21.50	-0.27	+21.00	-0.33
+21.00	-0.07	+21.00	-0.07	+20.80	-0.16
+20.50	+0.28	+20.50	+0.11	+20.00	+0.18
+20.00	+0.52	+20.00	+0.74	+19.50	+0.52
+20.90	Emmet	+21.11	Emmet	+20.27	Emmet
Holladay 1		Holladay 1		Holladay 1	
SF: +1.84		SF: +1.84		SF: +1.84	
IOL (D)	Ref (D)	IOL (D)	Ref (D)	IOL (D)	Ref (D)
+22.00	-0.70	+21.50	-0.75	+21.50	-0.75
+21.50	-0.35	+21.00	-0.40	+20.80	-0.06
+21.00	-0.01	+21.00	+0.23	+20.50	+0.28
+20.50	+0.57	+20.50	+0.79	+19.50	+0.61
+20.99	Emmet	+20.41	Emmet	+20.41	Emmet

Thebpatiphat N, Hammersmith KM, Rapuano CJ, Ayres BD, Cohen EJ. Cataract surgery in keratoconus. Eye Contact Lens. 2007 Sep;33(5):244-6.

Savini G, Abbate R, Hoffer KJ, Mularoni A, Imburgia A, Avoni L, D'Eliseo D, Schiano-Lomoriello D. Intraocular lens power calculation in eyes with keratoconus. J Cataract Refract Surg. 2019 Feb 21.

Biometry in the Keratoconic Patient

Holladay Report with more advanced KCN and show power distribution curve for KCN

Oculus Optikgeräte GmbH 35582 Wetzlar Tel: (0641) 20 05-0 www.oculus.de
 Münchholzhäuser Str. 29 Fax: (0641) 20 05-255

Holladay EKR Detail Report

Name: PINELES, ABRAHAM Date of Birth: 02/28/1948 Patient ID: 127463 Exam Date: 07/16/2018 OS: Alignment [5] Error Eye: Left
 Exam Time: 13:40:13 Exam Info:

Equiv K-Readings (S (D)) calculated on rings centered on pupil center (Holladay)

Zone Diameter	1.0 mm	2.0 mm	3.0 mm	4.0 mm	4.5 mm	5.0 mm	6.0 mm	7.0 mm
EKR65 Flat K1	43.11 (155.2)	43.07 (149.1)	43.24 (146.1)	44.02 (131.0)	44.40 (127.7)	44.60 (125.0)	44.75 (120.0)	44.93 (118.1)
				2 (41.0)	45.42 (37.7)	45.61 (35.0)	45.71 (30.0)	45.90 (28.1)

EKR65 Mean: 44.85 44.90 44.70 44.52 **44.91** 45.11 45.23 45.42
 Avg EKR65: 1.02 1.01 0.96 0.97
 Zonal Global M: 44.68 44.78 44.99 45.15
 Zonal Std Dev: 0.72 0.98 1.05 0.98 0.94 0.90 0.86 0.87
 Zonal Samples (N): 2009 7957 17809 31593 39968 49293 70937 96473

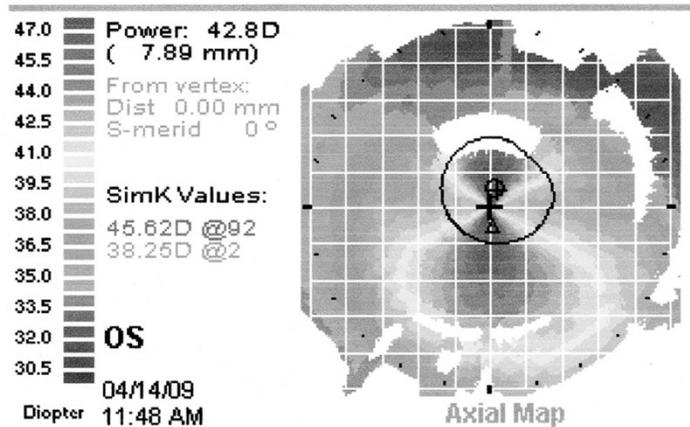
Equivalent K-Reading (S Power)

EKR65 Flat K1: **44.40 (127.7)**
 EKR65 Steep K2: **45.42 (37.7)**
 EKR65 Mean: **44.91 D**
 Avg EKR65: **1.02 D**
 Global Mean EKR: 44.68 D
 Highest Peak EKR: 44.40 D

Edi size of calculation zone:
 Zone Dia: 4.5 mm

Pupil Pos X: 0.15 mm
 Pupil Pos Y: 0.07 mm
 Pupil Dia: 1.87 mm

Astigmatism Management



Astigmatism Management

- Treating astigmatism in the keratoconus patient can be challenging
- Multiple clinical factors need to be known
 - Stability of cornea and refraction (MRx)
 - Does patient wear glasses, SCL (toric), or any rigid contact lens?
 - Has corneal influences related to CL wear been reduced or removed?
 - Are the astigmatic magnitude & axis measurable, and are they within the IOL treatment parameters?

Astigmatism Management

- Very few large studies
- Allard and Zetterberg (2018) looked a 4 eyes with fairly regular astigmatism
- Kamiya published a series of 19 patients with good results in carefully selected patients
- Hashemi looked at 23 eyes with KCN, astigmatism measured with manual K, topography, and Pentacam
 - Favorable results using keratometry derived from 3 mm central zone
 - SRK/T formula gave lowest error
- In many cases it may be a astigmatism reducing procedure, not eliminating

Allard K, Zetterberg M. Implantation of toric intraocular lenses in patients with cataract and keratoconus: a case series. Int Med Case Rep J. 2018 Aug 28;11:185-191.
 Kamiya K, Shimizu K, Miyake T. Changes in astigmatism and corneal higher-order aberrations after phacoemulsification with toric intraocular lens implantation for mild keratoconus with cataract. Jpn J Ophthalmol. 2016 Jul;60(4):302-8.
 Hashemi H, Heidarian S, Seyedian MA, Yekta A, Khabazkhoob M. Evaluation of the Results of Using Toric IOL in the Cataract Surgery of Keratoconus Patients. Eye Contact Lens. 2015 Nov;41(6):354-8.

Astigmatism Management

Oculus Optikgeräte GmbH 35582 Wetzlar Tel: (0641) 20 05-0 www.oculus.de
 Munchholzhauser Str. 29 Fax: (0641) 20 05-255

Holladay EKR Detail Report 1.21.20

Name: _____ Exam Date: 09/21/2018 OS: Alignment (°) Error: _____ Eye: Right
 Date of Birth: _____ Exam Time: 10:57:01 Exam Info: _____

Literature Equiv K-Readings (D) calculated on rings centered on pupil center (Holladay) Holladay Resp.

Zone Diameter	1.0 mm	2.0 mm	3.0 mm	4.0 mm	4.5 mm	5.0 mm	6.0 mm	7.0 mm
EKR65 Flat K1	45.01 (144.7)	47.99 (144.7)	47.64 (144.3)	47.63 (143.3)	47.60 (142.6)	47.53 (142.0)	47.44 (140.8)	47.17 (139.5)
EKR65 Steep K2	45.97 (134.7)	50.72 (144.7)	50.97 (144.3)	51.08 (143.3)	51.00 (142.6)	50.86 (142.0)	50.59 (140.8)	50.15 (139.5)
EKR65 Mean	45.49	49.35	49.30	49.35	49.30	49.19	49.02	48.66
Avg EKR65	0.96	2.74	3.34	3.44	3.40	3.33	3.15	2.97
Zonal Global Mean EKR	48.37	47.78	47.44	47.13	46.98	46.83	46.56	46.29
Zonal Std Dev	1.83	2.45	3.00	3.40	3.54	3.64	3.76	3.82
Zonal Samples (N)	2009	7957	17809	31593	39968	49293	70937	96473

— Mean Zonal EKR (D) vs Zone Dia
 — Mean Zonal Ast/Sag. Cur. (mm) vs Zone Dia
 — Mean Ring Ast/Sag. Cur. (mm) vs Ring Dia

Distribution of EKR in Actual Zone

Equivalent K-Reading 65 Power

Equiv K-Readings 65 in Actual Zone

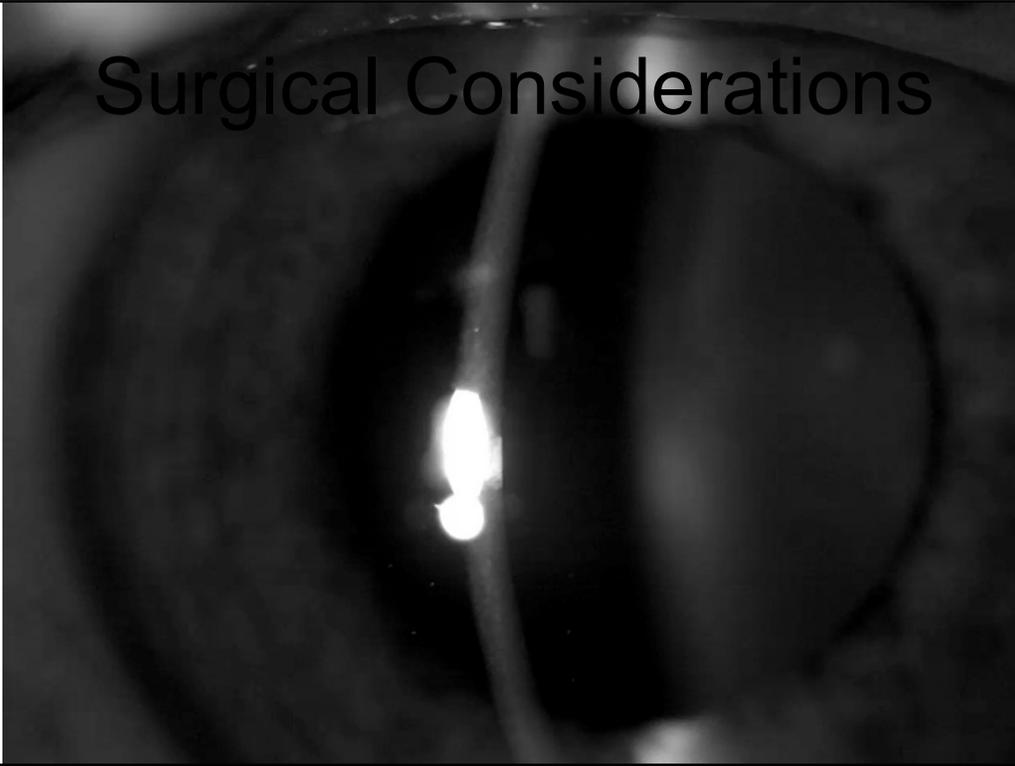
EKR65 Flat K1: **47.60 (142.6 °)**
 EKR65 Steep K2: **51.00 (142.6 °)**
 EKR65 Mean: **49.30 D**
 Avg EKR65: **3.40 D**
 Global Mean EKR: 46.98 D
 Highest Peak EKR: 49.60 D

Edit size of calculation zone:
 Zone Dia: 4.5 mm

Pupil Pos X: 0.26 mm
 Pupil Pos Y: 0.29 mm
 Pupil Dia: 3.09 mm

Curvature 0.50 D
 Ret

Surgical Considerations



Surgical Considerations

- Clinical exam is of utmost importance
 - Stability of MRx & KCN cornea
 - Peripheral thinning: Location & size
 - Corneal scarring: Location & size
 - Anterior chamber depth
- Modify technique depending on clinical exam



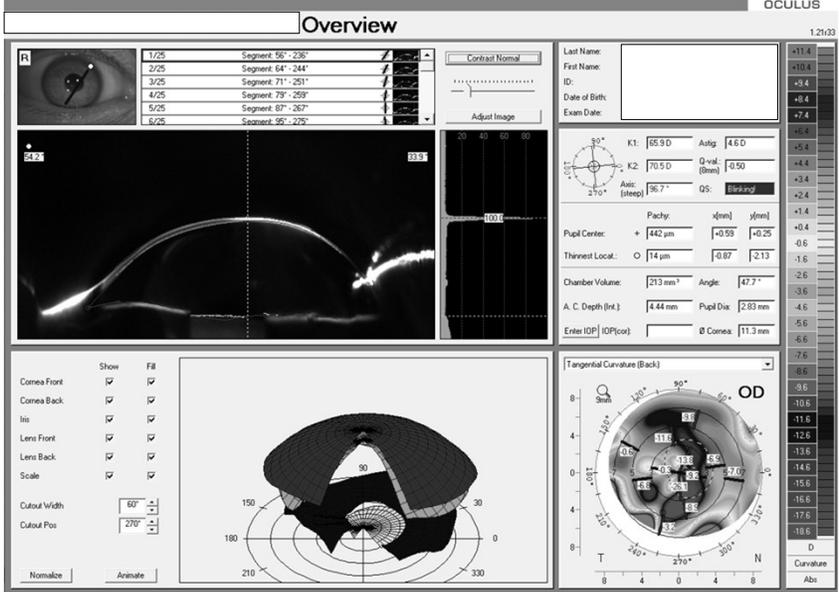
Surgical Considerations

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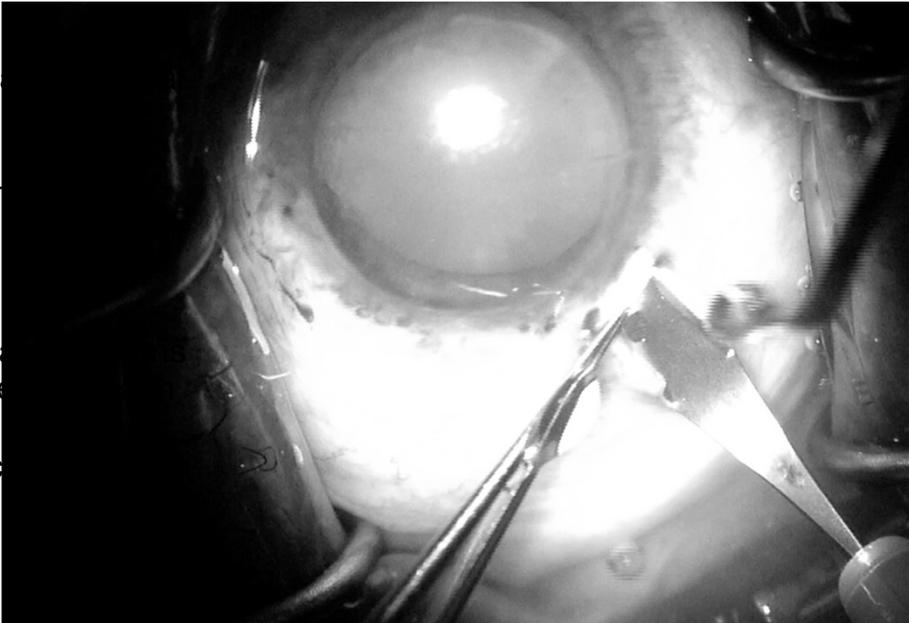
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Surgical Pearls

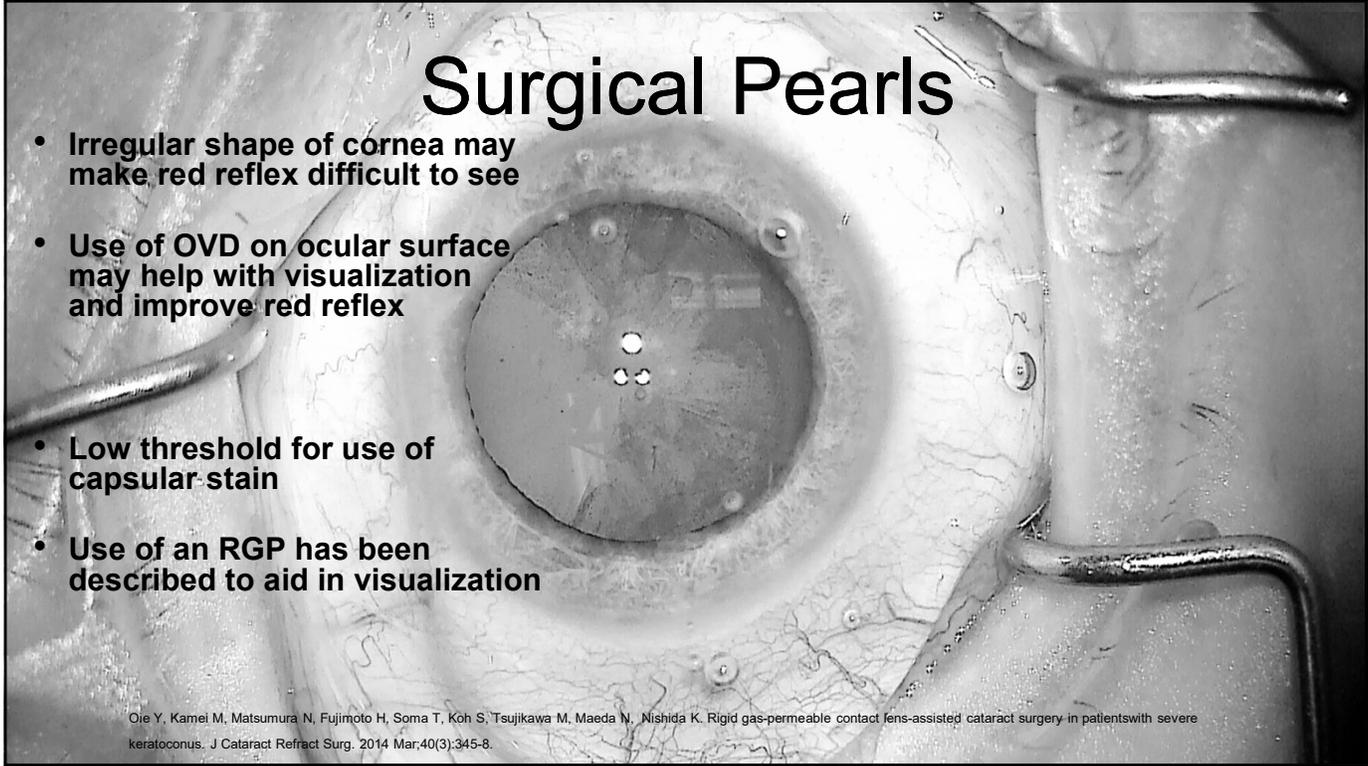
- Move main incision to area thinning
- Superior temporal wound
- Superior approach
- May need to consider "ne exchange" or scleral tunnel
- Very low threshold to place wound



Surgical Pearls

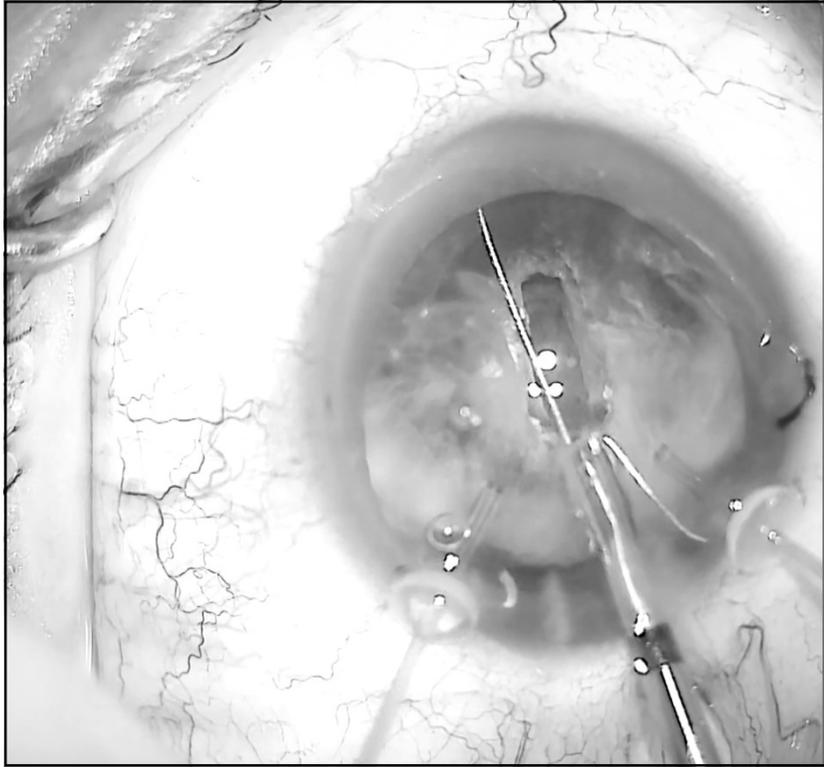
- Irregular shape of cornea may make red reflex difficult to see
- Use of OVD on ocular surface may help with visualization and improve red reflex
- Low threshold for use of capsular stain
- Use of an RGP has been described to aid in visualization

Oie Y, Kamei M, Matsumura N, Fujimoto H, Soma T, Koh S, Tsujikawa M, Maeda N, Nishida K. Rigid gas-permeable contact lens-assisted cataract surgery in patients with severe keratoconus. J Cataract Refract Surg. 2014 Mar;40(3):345-8.



MiLoop Tips For Use

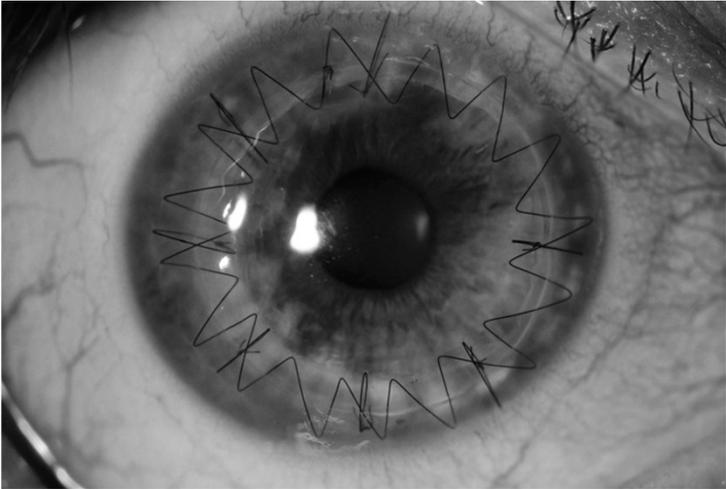
- Place OVD under anterior capsule
- Black mark on MiLoop helps with centration
- Slowly rotate loop
- Constriction of the loop may rotate the lens
- Use second instrument to prevent lens rotation



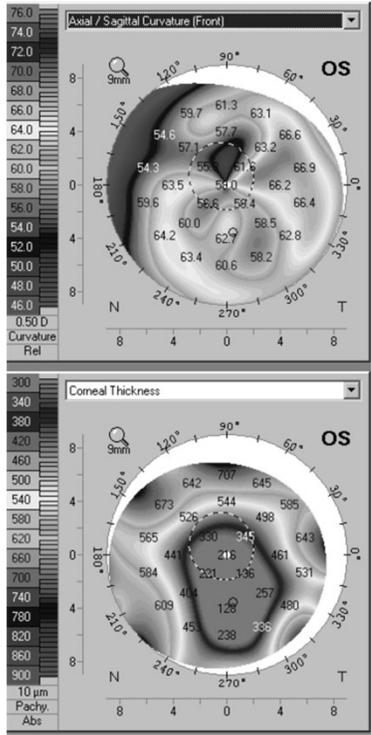
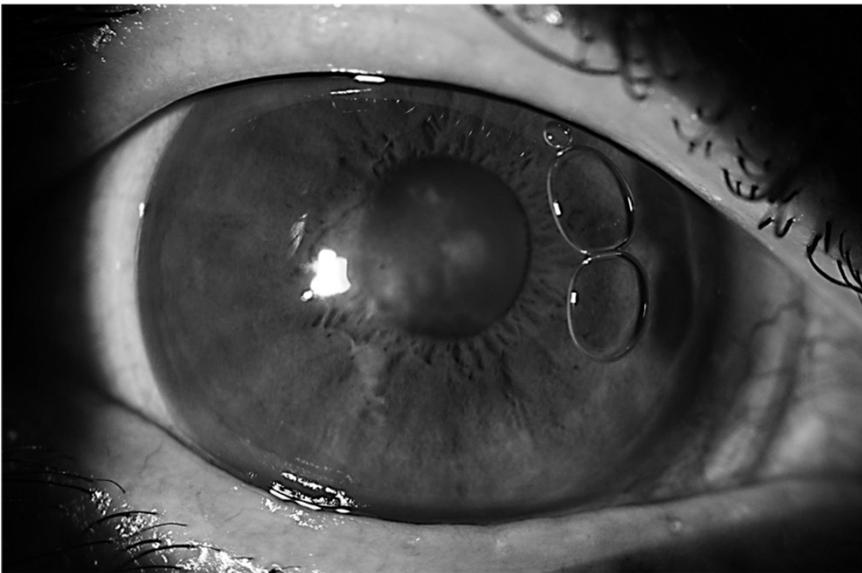
When to Treat the Cornea

Consider Keratoplasty 1st or Combo Tx, if

- Clinically significant corneal scarring
- Non healing hydrops
- Inadequate view into anterior chamber for safe cataract removal
- High levels of irregular astigmatism and inability to wear RGP
- Staging PKP first before cataract removal, if lens changes are mild



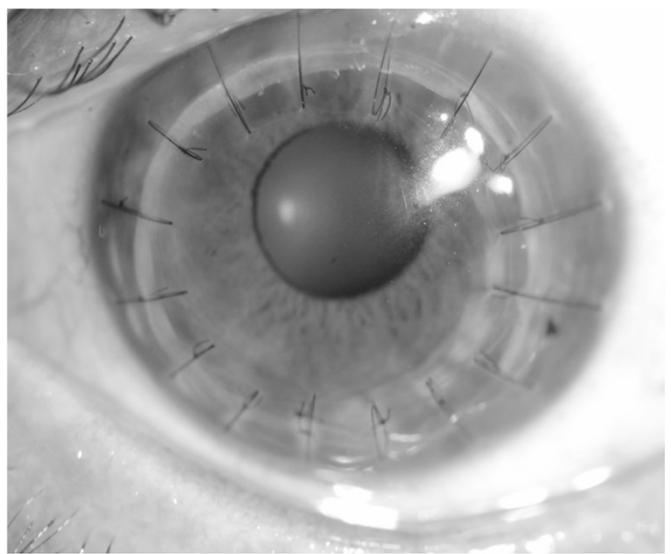
When to Treat the Cornea

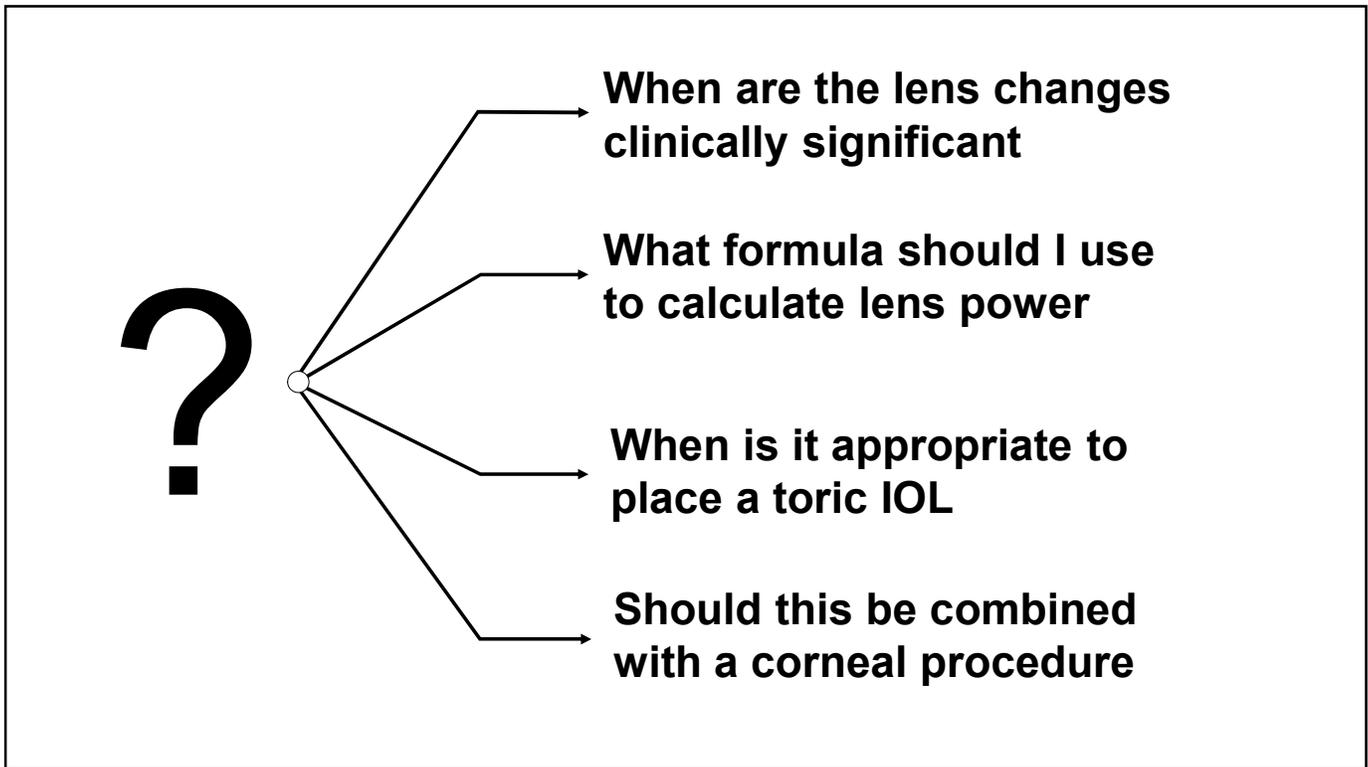


When to Treat the Cornea



When to Treat the Cornea





When are the lens changes clinically significant

What formula should I use to calculate lens power

When is it appropriate to place a toric IOL

Should this be combined with a corneal procedure

- Careful clinical exam is necessary
- Confirm stability of the cornea
- RGP refraction is a simple tool to help differentiate cornea from lens as etiology of changes in vision

When are the lens changes clinically significant

What formula should I use to calculate lens power

When is it appropriate to place a toric IOL

Should this be combined with a corneal procedure

- The more ways the cornea can be imaged the better
- Advanced imaging systems can be helpful at estimation of corneal power
- Most formulas will overestimate the corneal power so plan a myopic target
- In advanced KCN, corneal power may need to be estimated in the event PKP needs to be planned later

When are the lens changes clinically significant

What formula should I use to calculate lens power

When is it appropriate to place a toric IOL

Should this be combined with a corneal procedure

- In mild KCN with fairly regular astigmatism, toric IOL can be considered
- Avoid in patient doing well with rigid contact lenses
- In many cases, toric IOL's will only reduce astigmatism (not eliminate)

When are the lens changes clinically significant

What formula should I use to calculate lens power

When is it appropriate to place a toric IOL

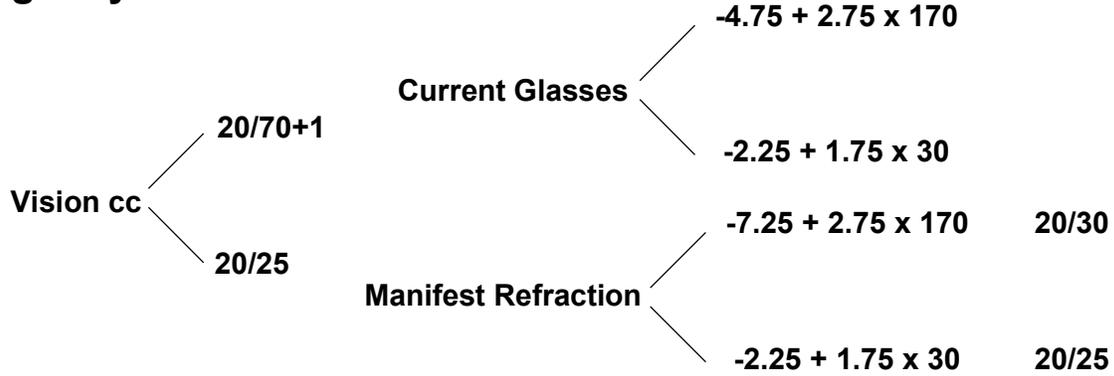
Should this be combined with a corneal procedure

- In cases where the cornea will significantly limit best corrected vision
- Corneal scars or persistent hydrops
- Patient who can not tolerate contact lens correction and have high irregular astigmatism
- Consider PKP first, then cataract surgery
- If PKP is likely in future, IOL power should be adjusted or estimated - in anticipation of future corneal power changes

Clinical Case

Case 1

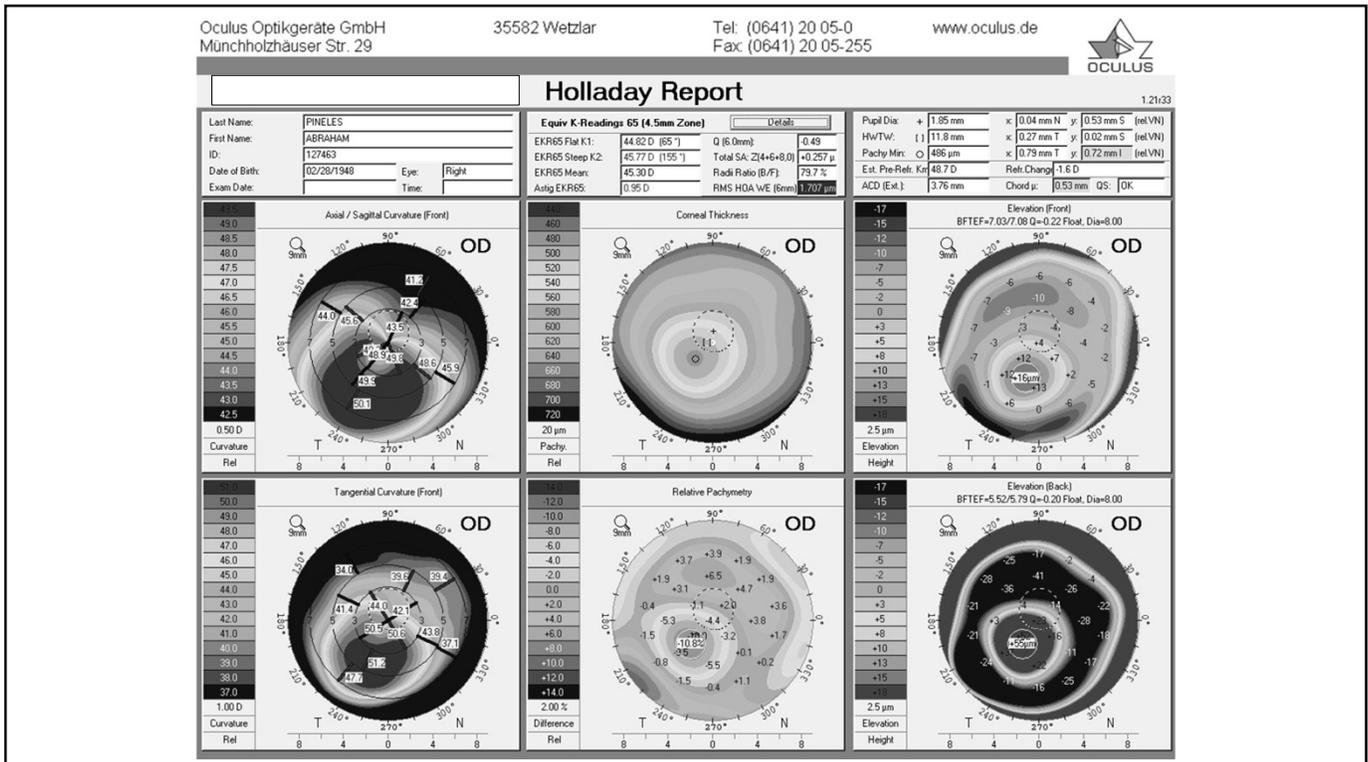
70 year old man with a complaint of reduced vision worse on right eye than left



OD right		IOL calculation (Multifomula)				OS left	
		(!) Indicates an uncertain measurement value. (*) Indicates that this value has been edited manually. --- Indicates a measurement failure.					
AL: 24.62 mm (SD = 10 µm) ACD: 3.70 mm (SD = 5 µm) LT: 4.47 mm (SD = 17 µm) SE: 47.33 D K1: 45.67 D @ 65°		WTW: 12.2 mm Δ D: +3.45 D @ 155° K2: 49.12 D @ 155° VA: --- SIA: +0.00 D @ 0°		AL: 24.39 mm (SD = 9 µm) ACD: 3.42 mm (SD = 9 µm) LT: 4.70 mm (SD = 14 µm) SE: 44.54 D K1: 43.20 D @ 128°		WTW: 12.3 mm Δ D: +2.76 D @ 38° K2: 45.96 D @ 38° VA: --- SIA: +0.00 D @ 0°	
Ref: --- Target ref.: plano LS: Phakic; VS: Vitreous body; LVC: Untreated; LVC mode: -				Ref: --- Target ref.: plano LS: Phakic; VS: Vitreous body; LVC: Untreated; LVC mode: -			
SRK/T A const.: 119.00		Hoffer Q pACD: +5.64		SRK/T A const.: 119.00		Hoffer Q pACD: +5.64	
IOL (D)	Ref (D)	IOL (D)	Ref (D)	IOL (D)	Ref (D)	IOL (D)	Ref (D)
+14.50	-0.60	+13.00	-0.88	+18.50	-0.73	+18.00	-0.73
+14.00	-0.31	+12.50	-0.37	+18.00	-0.40	+17.50	-0.41
+13.50	-0.03	+12.00	-0.06	+17.50	-0.08	+17.00	-0.08
+13.00	+0.26	+11.50	+0.24	+17.00	+0.24	+16.50	+0.24
+12.50	+0.53	+11.00	+0.54	+16.50	+0.56	+16.00	+0.56
+13.45	Emme.	+11.90	Emme.	+17.38	Emme.	+16.87	Emme.
Holladay 1 SF: +1.84		Barrett LF: +1.88 DF: +5.00		Holladay 1 SF: +1.84		Barrett LF: +1.88 DF: +5.00	
IOL (D)	Ref (D)	IOL (D)	Ref (D)	IOL (D)	Ref (D)	IOL (D)	Ref (D)
+13.50	-0.45	+13.50	-0.61	+18.00	-0.52	+18.00	-0.54
+13.00	-0.16	+13.00	-0.29	+17.50	-0.20	+17.50	-0.20
+12.50	+0.13	+12.50	+0.03	+17.00	+0.12	+17.00	+0.14
+12.00	+0.42	+12.00	+0.34	+16.50	+0.44	+16.50	+0.47
+11.50	+0.71	+11.50	+0.65	+16.00	+0.75	+16.00	+0.80
+12.73	Emme.	+12.54	Emme.	+17.19	Emme.	+17.21	Emme.
Comment							

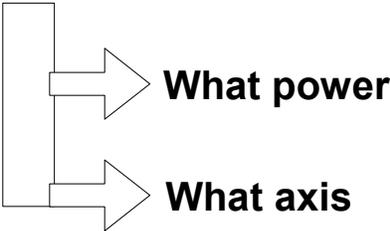
OD right		Reference image			
		AL: 24.62 mm (SD = 10 µm) ACD: 3.70 mm (SD = 5 µm) LT: 4.47 mm (SD = 17 µm)			
VA: --- LS: Phakic; VS: Vitreous body;		SE: 47.33 D K1: 45.67 D @ 65° K2: 49.12 D @ 155° Δ D: +3.45 D @ 155° WTW: 12.2 mm Ref: ---			
Comment					

What do you want to do?



Scheduled for surgery

Plan for FLACS with placement of toric IOL



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Holladay Report

Last Name: PINELES First Name: ABRAHAM ID: 127463 Date of Birth: 02/28/1948 Eye: Right Exam Date: Time:		Equiv K-Readings 65 (4.5mm Zone) EK R65 Flat K1: 44.62 D (85°) Q (6.0mm): -0.49 EK R65 Steep K2: 45.77 D (195°) Total SA: Z14+6+8.0: +0.257 μ EK R65 Mean: 45.30 D Radi Ratio (R/F): 79.7 % Astig EK R65: 0.95 D RMS HOA WE (8mm): 17.07 μm		Pupil Dia: + 1.85 mm x [0.04 mm N y [0.53 mm S [rel.VN] HW/TW: () 11.8 mm x [0.27 mm T y [0.02 mm S [rel.VN] Pachy Mix: O 486 μm x [0.79 mm T y [0.72 mm I [rel.VN] Est. Pre-Ref. K: 48.7 D Refl. Chang: 1.6 D ACD (E.A.): 3.76 mm Chord p: 0.53 mm QS: OK	
Axial / Sagittal Curvature (Front) 		Corneal Thickness 		Elevation (Front) BFTEF=7.03/7.08 Q=-0.22 Float. Dia=8.00 	
Tangential Curvature (Front) 		Relative Pachymetry 		Elevation (Back) BFTEF=-5.52/5.79 Q=-0.20 Float. Dia=8.00 	

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Holladay EKR Detail Report

1.21:33

Name: PINELES, ABRAHAM Exam Date: 07/16/2018 OS: OK Eye: Right
 Date of Birth: 02/28/1948 Patient ID: 127463 Exam Time: 13:39:02 Exam Info:

Zone Diameter	1.0 mm	2.0 mm	3.0 mm	4.0 mm	4.5 mm	5.0 mm	6.0 mm	7.0 mm
EKR65 Flat K1	44.31 (96.9°)	44.52 (80.9°)	44.57 (74.6°)	44.72 (68.3°)	44.82 (65.3°)	44.95 (62.4°)	45.06 (57.7°)	45.49 (55.6°)
EKR65 Steep K2	44.69 (6.9°)	45.20 (170.9°)	45.54 (164.6°)	45.69 (158.3°)	45.77 (155.3°)	45.85 (152.4°)	45.85 (147.7°)	46.08 (145.6°)
EKR65 Mean	44.50	44.86	45.06	45.20	45.30	45.40	45.45	45.79
Astig EKR65	0.38	0.68	0.96	0.97	0.94	0.91	0.79	0.60
Zonal Global Mean EKR	44.98	45.66	45.90	46.08	46.16	46.23	46.36	46.44
Zonal Std Dev	0.82	1.28	1.35	1.46	1.53	1.61	1.81	2.07
Zonal Samples (N)	2009	7957	17809	31593	39968	49293	70937	96473

Distribution of EKR in Actual Zone

Equivalent K-Reading 65 in Actual Zone

EKR65 Flat K1: **44.82 (65.3°)**
 EKR65 Steep K2: **45.77 (155.3°)**
 EKR65 Mean: **45.30 D**
 Astig EKR65: **0.95 D**
 Global Mean EKR: 46.16 D
 Highest Peak EKR: 44.10 D

Edit size of calculation zone:

Zone Dia: 4.5 mm

Pupil Pos X: 0.04 mm
 Pupil Pos Y: 0.53 mm
 Pupil Dia: 1.85 mm

Equivalent K-Reading 65 Power

IOL Master Data

SURGEON NAME: Ayres PATIENT NAME: Cant Say PRODUCT SELECTION: IQ Toric SNG6Tx EYE SELECTION: Right Eye

FORMULA: Barrett

AXIAL LENGTH: 24.62 mm ANTERIOR CHAMBER DEPTH: 3.7 mm

K NOTATION: Dioptr

FLAT K: 45.67 D FLAT MERIDIAN: 65°
 STEEP K: 49.12 D STEEP MERIDIAN: 155°
 IOL SE POWER: 13.0 D

SURGICALLY INDUCED ASTIGMATISM (SIA): 0.15 D INCISION LOCATION: 220°
 K INDEX: 1.3375

NOTES: Calculate Print Clear Fields

Anticipated Residual Refractive Astigmatism

Select	Lens	Magnitude	Axis
<input type="radio"/>	Non Toric	+3.55 D	158°
<input type="radio"/>	SNGA17	+0.75 D	157°
<input type="radio"/>	SNGA18	+0.29 D	157°
<input checked="" type="radio"/>	SNGA19	+0.18 D	67°

Recommended lens. Flipped residual refractive astigmatism axis.

Secure ID: #50FE13145E829787C84181B2C5888FC1

Holladay Report Data

SURGEON NAME: Ayres PATIENT NAME: Cant Say PRODUCT SELECTION: IQ Toric SNG6Tx EYE SELECTION: Right Eye

FORMULA: Barrett

AXIAL LENGTH: 24.62 mm ANTERIOR CHAMBER DEPTH: 3.7 mm

K NOTATION: Dioptr

FLAT K: 44.82 D FLAT MERIDIAN: 65°
 STEEP K: 45.77 D STEEP MERIDIAN: 155°
 IOL SE POWER: 13.0 D

SURGICALLY INDUCED ASTIGMATISM (SIA): 0.2 D INCISION LOCATION: 220°
 K INDEX: 1.3375

NOTES: Calculate Print Clear Fields

Anticipated Residual Refractive Astigmatism

Select	Lens	Magnitude	Axis
<input type="radio"/>	Non Toric	+1.29 D	160°
<input type="radio"/>	SNGA13	+0.34 D	160°
<input checked="" type="radio"/>	SNGA14	+0.13 D	69°
<input type="radio"/>	SNGA15	+0.61 D	69°

Recommended lens. Flipped residual refractive astigmatism axis.

Secure ID: #43AE31BA221D17C7F5DC7D6473482F77

Questions? Thank you

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