Making sense of topography and how to evaluate the cornea for cataract surgery

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Corneal topography

- Way to understand corneal shape/curvature
- Especially important in the following patients:
  - Toric IOL candidates
  - Premium-channel IOL candidates
  - Post-refractive patients
  - Corneal pathology, assess irregular astigmatism
  - Unexplained loss of BSCVA
Corneal topography: Placido Disk

- Introduced by Antonio Placido da Costa in 1880
- Target with concentric rings that alternate black and white mires reflected off corneal surface
- Mires are closer on steep portions of the cornea
- Mires are further apart on flat portions of the cornea
- Corneal astigmatism results in ovalization of circular mires
Corneal topography: Reading Maps

- Digital image of Placido target is used by computer to calculate curvature along mires
- Warmer colors generally represent steeper areas (higher power)
- Cooler colors generally represent flatter areas (lower power)
- Scale can vary, pay attention
Absolute scale: Preset scale, same steps, same color, able to compare maps, better for screening
Different color scales based on max and min power of each cornea, cannot compare maps based on color, smaller steps.
Regular vs Irregular Astigmatism

- **Regular** astigmatism: able to be neutralized with spherocylindrical lens (good TORIC IOL pts)
- Looks like bow-tie or “figure of 8” on topography (any axis)
- OK if asymmetric
- NOT OK if “lazy”, (non-orthogonal)
- If concerned, check posterior corneal surface and thickness map
**Slit scanning (tomography)**

- **Oculus Pentacam**—*corneal elevation*
  
  - Uses Scheimpflug optics to increase depth of focus so that cornea, iris, and lens can be simultaneously imaged
  
  - The camera and slit beam rotate around the eye 180 degrees in 2 seconds to produce 25 images of front and back surface
  
  - Common central point for image registration
Belin-Ambrosio enhanced ectasia screening
Slit scanning (tomography)

- **Bausch and Lomb Orbscan** – combines slit beam and Placido disk imaging
  - Topographer and tomographer
  - Takes 20 slit beam images on each side of video axis in two 0.75 second intervals
  - Uses parallel slit beams, no central registration point
  - Limited utility in measuring post-operative posterior cornea
Myopic LASIK
Hyperopic LASIK
Post Myopic LASIK Ectasia
IOL power calculation in eyes that have undergone LASIK/PRK/RK

Prior Myopic LASIK/PRK  Prior Hyperopic LASIK/PRK  Prior RK

Warren Hill, M.D.
Li Wang, M.D., Ph.D.
Douglas D. Koch, M.D.

Version 4.5
Made possible by an unrestricted educational grant from Alcon Laboratories and The ASCRS Foundation
IOL calculation post refractive surgery:

IOLcalc.org

IOL Calculator for Eyes with Prior Myopic LASIK/PRK

(Your data will not be saved. Please print a copy for your record.)

Please enter all data available and press "Calculate"

<table>
<thead>
<tr>
<th>Doctor Name</th>
<th>Patient Name</th>
<th>Eye</th>
<th>IOL Model</th>
</tr>
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</table>

Pre-LASIK/PRK Data:

- Refraction*: Sph(D) □, Cyl(D)* □, Vertex (If empty, 12.5 mm will be used)
- Keratometry: K1(D) □, K2(D) □

Post-LASIK/PRK Data:

- Refraction*: Sph(D) □, Cyl(D)* □, Vertex (mm)
- Topography: EyeSys □, Atlas 9000 □, Tomey ACCP □, Galilei TCP** □
- Atlas Ring Values: 0mm □, 1mm □, 2mm □, 3mm □

Optical (IOLMaster/Lenstar)/Ultrasound Biometric Data:

- Ks: K1(D) □, K2(D) □
- AL(mm) □, ACD(mm) □
- Lens Constants**: A-const(SRK/T) □, SF(Holladay1) □, Haigis a0 □, Haigis a1 □, Haigis a2 □
- Keratometric Index (n)**: 1.3375 □, 1.332 □, Other □
- Target Ref (D) □

*If entering "Sph(D)", you must enter a value for "Cyl(D)", even if it is zero.

§Most recent stable refraction prior to development of a cataract.

# Magellan ACP or OPD-Scan III APP 3-mm manual value (personal communication Stephen D. Klyce, PhD).

**"Select the version of your Galilei device. "V5.2 or earlier" or "V5.2.1 or later".

***Select the keratometric index (n) of your device. Instruments in North America typically default to 1.3375.

****Enter any constants available; others will be calculated from those entered. If ultrasonic AL is entered, be sure to use your ultrasonic lens constants.
IOL calculation post LASIK: iolcalc.org
Corneal evaluation pre-cataract

- **ANTERIOR** cornea
  - Dry eye/dysfunctional tear syndrome
  - EBMD
  - Pterygia/Salzmann's nodules
  - Scars (HSV)
- **POSTERIOR** cornea
  - Fuchs
Examine, identify

Instill fluorescein with moistened strip, NOT fluress (combination anesthetic/fluorescein drops too thick). Diffuse blue light...and voila!
dysfunctional tear syndrome

- very common: affects vision, preoperative measurements, post-operative healing
- optimize PRE-operatively with
  - lubricants (not more than 6x/day--"dish pan eyes")
  - warm compresses (rice/sock for 15 min BID)
  - topical cyclosporine +/- steroid
  - punctal occlusion (after inflammation reduced)
  - omega 3's oral
  - oral doxycycline 50mg or azithromycin 500mg/250mg
  - autologous serum
Sjogren's syndrome melt
POD #10 s/p uncomplicated phaco
epithelial basement membrane dystrophy (EBMD)

- very common, affects pre and postoperative visual quality, pre-op K readings, often unrecognized

- if significant irregular astigmatism (irregular mires, irregular topography), consider treatment prior to cataract surgery
How to treat EBMD

- **Medical treatment**: lubrication, muro 128 drops and ung

- **Surgical treatment**: remove epithelium centrally (at least 6mm)
  - diamond burr polishing or PTK (especially if h/o recurrent erosions)
  - BCL, antibiotic qid, mild steroid qid, art tears qid
  - remove BCL after 4-5 days after re-epithelialization
  - wait 6 weeks, recheck K's
How to treat EBMD
Pterygia/Salzmann's nodules

- If peripheral, not affecting vision or topography, no need to treat

- Remember that peripheral pterygia/nodules can *induce* astigmatism centrally, so check topography if unsure

- Important when considering TORIC IOLs
Corneal scars

- if depressed scar causing *irregular* astigmatism, avoid toric and multifocal IOLs

- ask about history of HSV, cold sores

- if suspicious, oral antiviral prophylaxis is indicated

- acyclovir 800mg po TID starting 3 days prior. Continue until pt off topical steroids
Fuchs’ Dystrophy

- If any morning blur or edema on SLE → combined phaco/DSEK
- If not → proceed with GENTLE phaco alone
- I do not use pachymetry or endothelial cell count as criteria
- Intra-op for gentle phaco: use dispersive viscoelastic, BSS+, low flow, min energy
- Monofocal IOL, aim for -1.25 D (to neutralize hyperopic shift from DSAEK)
Fuchs: post-operative considerations

- Increased corneal edema likely, but prepare pt ahead
  - Hourly prednisolone acetate or difluprednate initially
  - Keep IOP low (under 18mmHg)
    - Avoid CAIs
  - Topical muro ung or gtts (q5minX3)
- Wait 3 mos before considering DSEK
When in doubt...

- Proceed with “gentle” phaco
  - Earlier may be better (lens is less dense, less traumatic surgery)
- Do not burn any bridges as long as patient is on same page
  - Unlike in PKP, want all DSEK patients to be pseudophakic (unless pre-presbyopic)
Proper assessment of corneal shape using topography and/or tomography is helpful prior to cataract surgery especially when considering Toric IOLs and in patients with prior refractive surgery.

Careful identification of corneal pathology with subsequent optimization is important to minimize post-operative complications.
Thanks for your attention!

Diya, almost 7

Kavi, age 4