Step by Step Corneal Topography: a systematic approach in reading, analyzing and interpreting corneal topography

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Placido based systems (*Curvature*)

- Reflect a series of concentric circles off the cornea
  - the cornea acts as a convex mirror
  - can not read if the cornea is badly distorted
- Measures the slope of the cornea and computes the curvature
  - elevations (shape) may not always be accurate
- Majority of topography systems in use today
Elevation based systems

- Project or transmit through the cornea
- do not need a reflective cornea
- can read on badly distorted surfaces
- elevation data is constructed by fitting the reference surface as smooth as possible to the data surface (Best Fit Sphere)
Color Scale: Elevation Map

- Relative elevation measures height difference in microns from a best-fitting reference sphere.
- In all elevation maps, green is the reference surface or zero level.
- Red is high and positive, Blue is low and negative.

- High: anterior to the reference surface.
- Low: posterior to the reference surface.

Elevation Map

Max: Red
- High
- Anterior to the reference surface

Min: Blue
- Low
- Posterior to the reference surface
3-D Reconstruction

- The rotation of the image system allows for triangulation and the generation of X, Y, and Z coordinates and the reconstruction of the anterior segment
- Scan Default - 25 images per scan
- Chamber volume analysis
- Preoperative planning for phakic IOL implantation
- IOP calculation
Topometric-asphericity

Application:
• Enhanced overview for refractive and cataract surgeons
• Detailed corneal structure analysis
• $Q < 1$ = prolate
• $Q > 1$ = oblate
• $Q = 0$ = sphere
4-maps refractive

- Elevation (Front) Float
- Elevation (Back) Float
- Corneal Thickness
- Sagittal Curvature (Front)
Tomography-cornea lens
Virtual eye

Cornea “wavefront” Zernike analysis
Compare 2 exams
Pilot from US Navy with ectasia after LASIK

Compare 4 exams
Keratoconus treated with CCL and topo-guided PRK
Keratoconus detection
Case # 11 ORB-Scan-Pentacam, post LASIK, Ectasia?

Yes with ORB-Scan

Not with Pentacam
CXL healing—can a get an accurate Orbscan or Pentacam?
Prophylactic CXL in LASIK
OcuLink Ablation Profile

Kanellopoulos, MD
www.brilliantvision.com
Wavefront Optimized™ Ablation Profile
Treatment:

• 50 microns PTK at 7mm OZ
• Topolyzer-guided treatment (due to the haze and irregularity was anticipated to be more accurate than the Oculyzer-guided Tx
• UVA CCL 3 mW/cm2 + 0.1% riboflavin 30 minutes
At 3 m UCVA 20/40, -0.50 -0.75 @ 62: 20/25
Diagnosis of KCN

- Pentacam
- Topography
- OCT pachymetry
- age
age

- Under 20: CXL ASAP
- 20-25 strongly encourage CXL and TgPRK
- 25-30 encourage CXL
- 30-35 discuss CXL
- Over 35 observe
- Over 40 CXL as a prophylaxis only if patient wants laser refractive procedure
Keratoconus

• Over 500
• 450-500
• 400-450
• Under 400
Ectasia?
Fter treatment of blepharitis!
Ectasia? no
Other eye
Ectasia?, 440 cornea!
Pachymetry distribution confirmation by OCT
Normal pachymetry distribution
Over 500

- TgPRK/CXL-Athens Protocol full tx
- 15 minuted CXL with 7mW/cm²
- 340mOsm B2 sodium phosphate
450-500

- Treat to 400 micron (50-90um treatments) TgPRK/CXL a
- B2 (340mOsm) and 15 minutes 7mW/cm²
400-450

- 20-50 micron treatment
- Focus on cylinder correction
- Respect the topography axis!
- Up to 70% of cylinder
- Up to 70 of sphere
- B2 (340mOsm) and 15 minutes 7mW/cm²
Under 400 (treated up to 320!)

- TgPRK/CXL: 5-10 microns
- B2 (340mOsm)
- UV: 7mw/cm² for 3 +3 min
- Or 3mW/cm² for 15 minutes
- Evaluate with OCT the CXL line
Even thin corneas:
3mW for 15 or 7mW for 3+3
4 years
PRK and CXL
Recent email from US
Over the last 7 years we have treated over 800 cases of KCN and ectasia with CXL

CXL followed 6 months later by a partial tPRK
Flattening with CXL
Plano to +2.5D!
Tuesday, September 7th, 17:00 to 20:00
# Program

## Excimer Laser Refractive Surgery
**Moderator:** Jorge L. Alio (Spain)

- **Arthur B. Cummings (Ireland)**
  - Case 1 – 32 year old with FFKC: PRK first vs. CXL first, vs. combined PRK and CXL
  - Discussion

- **Steven C. Schallhorn (United States)**
  - Case 2 – LASIK in patients with thin corneas
  - Discussion

- **Dan Z. Reinstein (England)**
  - Case 3 – LASIK in young patient with large pupils
  - Discussion

- **Jorge L. Alio (Spain)**
  - Case 4 – Surface ablation vs. LASIK vs. phakic IOLs in patients with higher levels of myopia
  - Discussion

- **Alaa El-Danasoury (Saudi Arabia)**
  - Case 5 – LASIK enhancement recommendations: flap lift vs. surface enhancements
  - Discussion

**Panelists**
- George D. Kymionis (Greece)
- Gustavo E. Tamayo (Colombia)
- Jack T. Holladay (United States)
- Julian D. Stevens (England)
- Mitchell A. Jackson (United States)
- Vikentia Katsanevakis (Greece)
- William B. Trattler (United States)

## Corneal Collagen Crosslinking
**Moderator:** William B. Trattler (United States)

- **R. Doyle Stulting (United States)**
  - Point / Counter Point: Epi-Off CXL
  - Discussion

- **Roberto Pinelli (Italy)**
  - Point / Counter Point: Epi-On CXL
  - Discussion

- **A. John Kanellopoulos (Greece)**
  - Point / Counter Point: Order of treatments – combination of custom surface ablation and CXL
  - Discussion

- **Simon P. Holland (Canada)**
  - Point / Counter Point: Order of treatments – sequential vs. combination of topography-guide PRK and CXL
  - Discussion

- **Renato Ambrosio Jr. (Brazil)**
  - FFKC: When to perform primary custom surface ablation vs. custom surface with CXL
  - Discussion

- **Frank W. Price Jr. (United States)**
  - Crosslinking for the treatment of corneal infections
  - Discussion

- **Jerome C. Vrughem (Belgium)**
  - Future indications of crosslinking (corneal edema
  - Discussion

**Panelists**
- Aleksandar Stoianovic (Norway)
- Aylin Uzbek (Turkey)
- Elena Albe (Italy)
- Juan-Carlos Abad (Colombia)

## Refractive Cataract Surgery
**Moderator:** Richard L. Lindstrom (United States)

- **Stephen G. Slade (United States)**
  - Femtosecond cataract surgery: Why it is a game changer
  - Discussion

- **Richard L. Lindstrom (United States)**
  - Presbyopic IOLs in patients with previous refractive surgery
  - Discussion

- **George Beiko (Canada)**
  - Options for patients with unilateral cataracts (other eye either phakic or pseudophakic with a monofocal IOL)
  - Discussion

- **Uday Devgan (United States)**
  - Presbyopic IOLs in challenging cases: PXE, Fuchs, ARMID
  - Discussion

- **Dimitra M. Portaliou (Greece)**
  - What is the real accommodation in accommodating IOLs?
  - Discussion

**Panelists**
- Amar Agarwal (India)
- Carlos Verges (Spain)
- Jack T. Holladay (United States)
- Jorge L. Allo (Spain)
- Mark Packer (United States)
- Patrick Versace (Australia)