

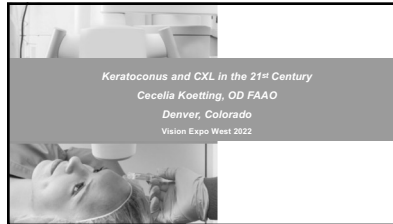
On behalf of Vision Expo, we sincerely thank you for being with us this year.

Vision Expo Has Gone Green!

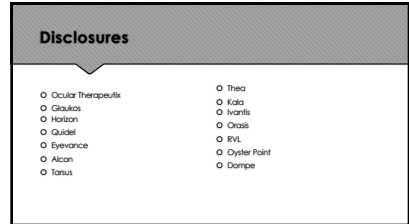
We have eliminated all paper session evaluation forms. Please be sure to complete your electronic session evaluations online when you login to request your CE Letter for each course you attended! Your feedback is important to us as our Conference Advisory Board considers content and speakers for future meetings to provide you with the best education possible.



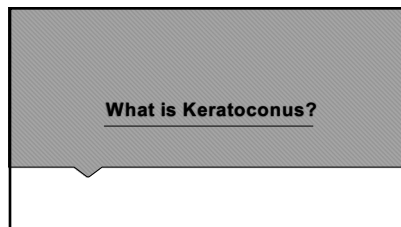
1



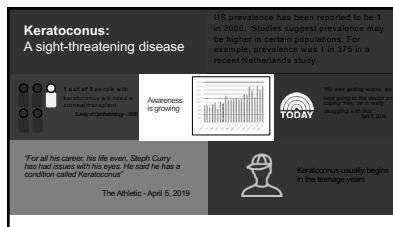
2



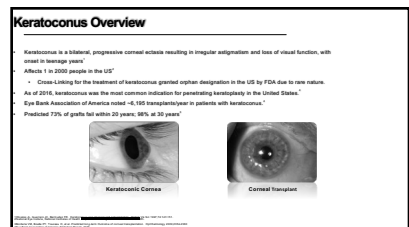
3



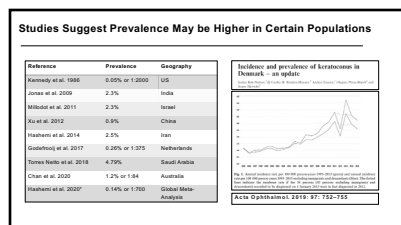
4



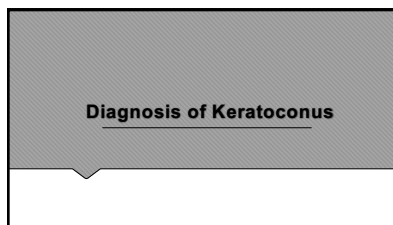
5



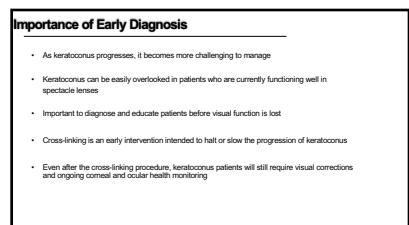
6



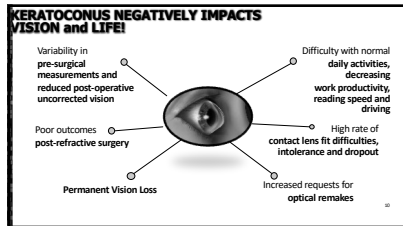
7



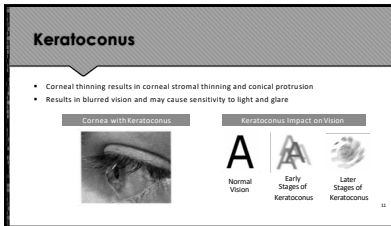
8



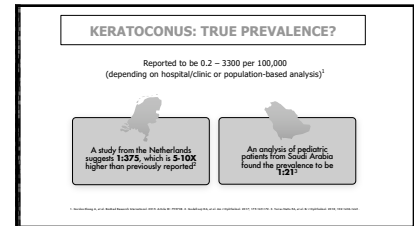
9



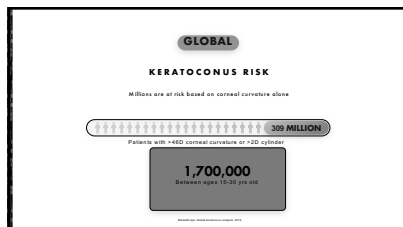
10



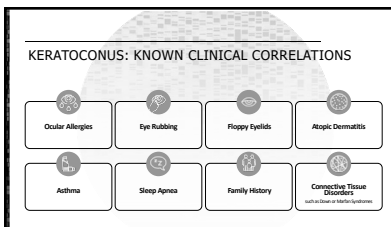
11



12



13



14

Signs and Symptoms that Could Signal KC

Look out for warning signs in medical history

- Family history of keratoconus
- Chronic eye rubbing and/or atopic eye diseases
- Systemic associations - Down syndrome - Connective tissue disorders

Look out for patient symptoms

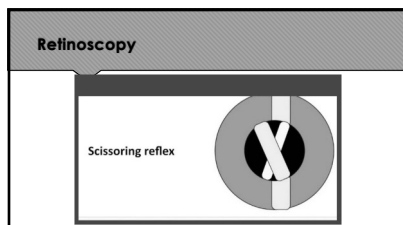
- Reduced visual quality or loss of vision
- Glare, halos, ghosting, and/or monocular diplopia (especially at night)
- Frequent changes in glasses prescriptions or contact lens needs

Look out for refractive anomalies

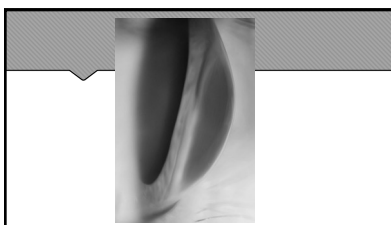
- Distortion of images on binocular
- Error messages on autorefractors
- Unsuccessful attempts at vision correction & progressive loss of UCVA & BCVA
- Increasing astigmatism

The American Academy of Ophthalmology Cornea Expert Preferred Practice Pattern recommends referral of patients with four or more of the above signs and symptoms to an ophthalmologist who can perform corneal topography.

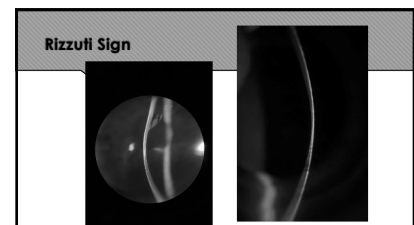
15



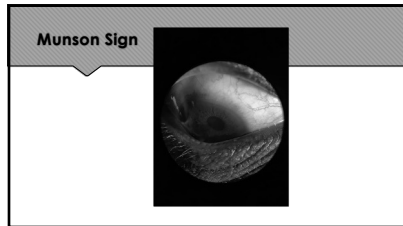
16



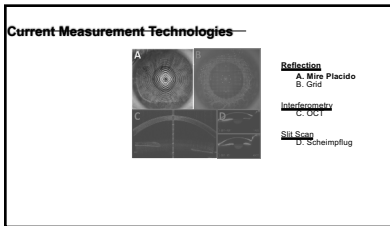
17



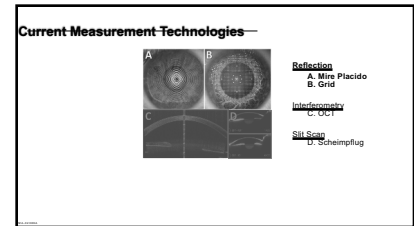
18



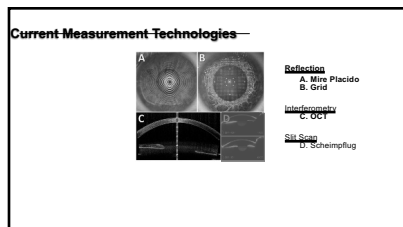
19



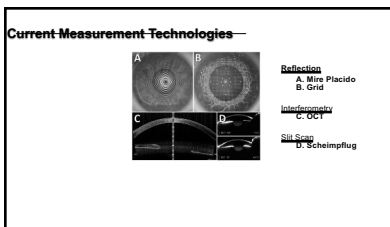
20



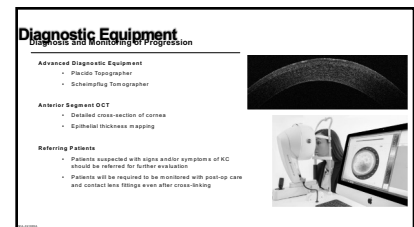
21



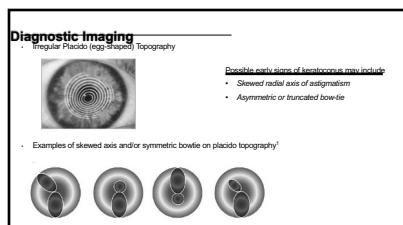
22



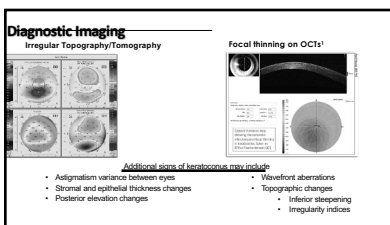
23



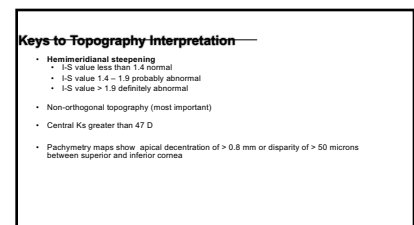
24



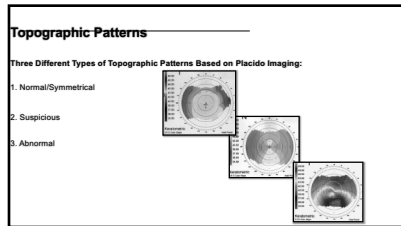
25



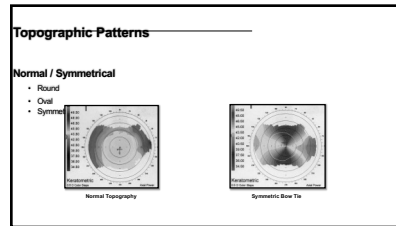
26



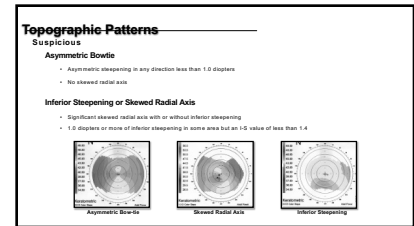
27



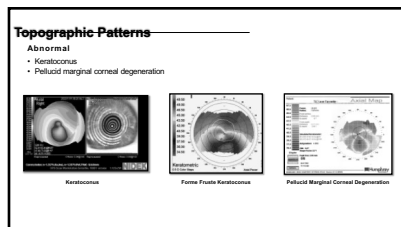
28



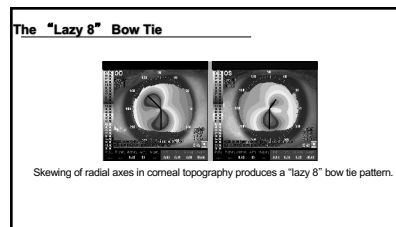
29



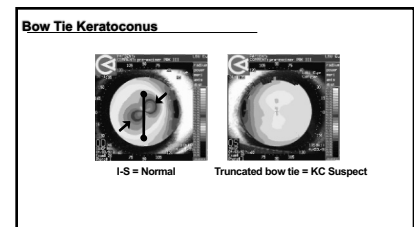
30



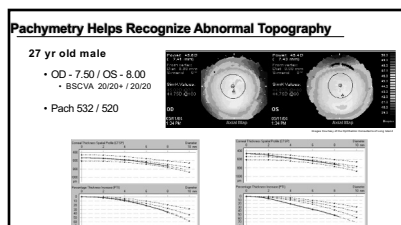
31



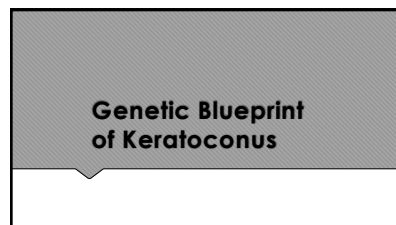
32



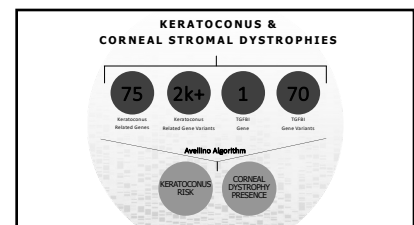
33



34



35



36

37

38

39

40

41

42

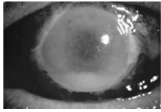
43

44

45

Complications of Penetrating Keratoplasty

- Integritative complications
 - Damage to endothelium
 - Regulae/epithelial defect
 - Poor graft adherence/graft failure
 - Excessive bleeding/bleeding and/or swelling
 - Choroidal detachment/retinal detachment
 - Intraocular pressure rise
 - Damage to donor tissue during handling
- Intraoperative postoperative complications
 - Wound leak
 - Not closed/leak/contamination/wound
 - Pseudo exfoliation
 - Posterior capsule defect
 - Endophthalmitis



© Eye Institute, University of California, San Francisco, 2010

46

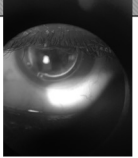
Newer Treatments

- Scleral contact lens
- Intacs Corneal Implant
- Partial Corneal Transplant
 - Deep Anterior Lamellar Keratoplasty (DALK)
- Corneal Crosslinking
 - ****only option that can help slow or stop progression and in some cases improvement is seen

47

Intacs Corneal Implants

- FDA approved for Keratoconus 2004
- Thin plastic semi-circular rings
 - Placed intrastromal
 - Help to flatten and reshape the cornea
- Slow or stop progression of disease
 - In combination with Corneal crosslinking



48

Intacs 5 year Data

- Ibrahim et al.
- 186 eyes, 127 patients
- Early or moderate keratoconus
- UCVA, BCVA and keratometric readings
 - Improved in 85% of eyes over preoperative baseline measures and remained stable over the 5-year follow-up

49

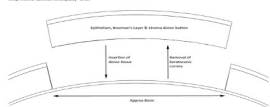
DALK: Deep Anterior Lamellar Keratoplasty

- Transplant all anterior corneal layers except the inferior to host Descemet's membrane and endothelium
- Donor epi is replaced with host tissue by limbal stem cells
- Indications:
 - Scarring
 - Stromal dystrophies
 - Corneal ectasias
- DALK vs. PK: eliminating risk of long term graft rejection
 - Less dependence on steroids
- Cons:
 - Time consuming
 - Possible perforation of Descemet
 - Post-op irregular eye

50

DALK

Deep Anterior Lamellar Keratoplasty - DALK



Apical layer, Descemet's layer, Endothelial layer, Anterior lamellar keratoplasty

Step 1: Removal of corneal layers to the level of Descemet's membrane

Step 2: Transplantation of donor corneal layers

Step 3: Reattachment of Descemet's membrane

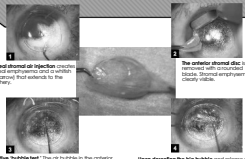
Step 4: Reattachment of endothelium

Approx. 100%

51

DALK: Surgical Steps

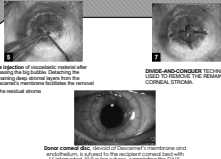
- Corneal dissection: The cornea is dissected in the anterior chamber with a microkeratome and a manual blade. The cornea is then removed and the endothelium is exposed.
- The anterior chamber (AC) is irrigated with balanced salt solution (BSS) to remove any debris.
- A posterior chamber IOL is inserted into the AC. The IOL is then removed and the AC is irrigated with BSS.
- The donor cornea is inserted into the AC. The donor cornea is then secured to the host cornea with sutures.



52

DALK: Surgical Steps

- The removal of corneal layers: The cornea is dissected in the anterior chamber with a microkeratome and a manual blade. The cornea is then removed and the endothelium is exposed.
- The donor cornea is inserted into the AC. The donor cornea is then secured to the host cornea with sutures.
- Donor corneal disc: The donor corneal disc is secured to the host cornea with sutures.



53

DALK: Surgical Steps

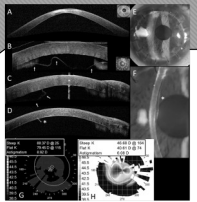


Photo credit: Albert Cheng, MD

54

Presenting. Corneal Crosslinking

- UV light and photosensitizer to strengthen chemical bonds in the cornea
 - Oxidative crosslinking reaction with amino chains of collagen
- Approved in the US 2016 by FDA
 - Epi-on vs Epi-off
- Indicated to help slow progression of:
 - Keratoconus
 - PMD
 - Termin Marginal Degeneration
 - Post-refractive surgery ectasia

55

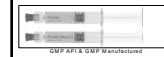
FDA-Approved Cross-Linking Procedure

56

FDA-Approved Cross-Linking Procedure

Product Platform

Photrexa® Viscous (riboflavin 5'-phosphate in 20% dextran ophthalmic solution)¹ and **Photrexa®** (riboflavin 5'-phosphate ophthalmic solution)² are photoenhancers indicated for use with the **KXL®** ultraviolet light delivery system in corneal collagen cross-linking procedures.³



57

FDA-Approved Corneal Cross-Linking

Indications

- Progressive Keratoconus & Corneal Ectasia Following Refractive Surgery (Post-LASIK Ectasia)
- Procedure involves:**
- Epithelium removal (Epi-off)
 - 30 min riboflavin application & 30 min exposure 365 nm UVA light, 3.0 mW/cm²
 - Intraoperative corneal thickness minimum: **400 microns**

Activated riboflavin and reactive oxygen species interact in cornea to form crosslinks: stiffens cornea

- Laboratory studies suggest 328.9% increase in biomechanical rigidity⁴

Less Cross-Linking (preoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

More Cross-Linking (postoperative)

58

FDA-Approved Corneal Cross-Linking

No other riboflavin solutions or UV devices have been approved for clinical use in the U.S. outside of a formal IDE (device) or IND (drug) study.

No specific age range limitations; patients ages 14 - 65, included in FDA studies.

Cross-Linking not advised during pregnancy

Ulcerative keratitis can occur; most common ocular adverse reaction was corneal opacity (haze)

- Other side effects may include punctate keratitis, corneal strain, dry eye, corneal epithelium defect, eye pain, light sensitivity, reduced visual acuity & blurred vision.

59

FDA-Approved Cross-Linking Procedure Summary

1. Remove epithelium.
2. Soak cornea with Photrexa® Viscous (riboflavin 5'-phosphate in 20% dextran ophthalmic solution).
 - ✓ 30 minutes
3. Check for haze.
4. Once haze is observed, measure corneal thickness.
 - ✓ Corneal thickness is less than 400 µm, instill 2 drops of Photrexa® (riboflavin 5'-phosphate ophthalmic solution) & continue until the corneal thickness increases to at least 400 µm.
 - ✓ Continue applying Photrexa Viscous (riboflavin 5'-phosphate in 20% dextran ophthalmic solution) during irradiation.

60

Keys to Patient Counseling: Discuss Treatment Goals



Aim of cross-linking is to halt or slow disease progression



Cross-Linking is not a refractive procedure



Post-op evaluation for visual correction will be necessary

61

Patient Counseling

Patients should be advised NOT to rub their eyes for the first five days after their procedure.

Patients may be sensitive to light and have a foreign body sensation.

They should be advised of possible discomfort in the treated eye and that sunglasses may help with light sensitivity.

If patients experience severe pain in the eye or any sudden decrease in their vision, they should be advised to contact their eye care provider immediately.

If the bandage contact lens that was placed on the patient's eye on the day of treatment falls out or becomes dislodged, the patient should be advised not to replace it and to contact their eye care provider immediately.



62

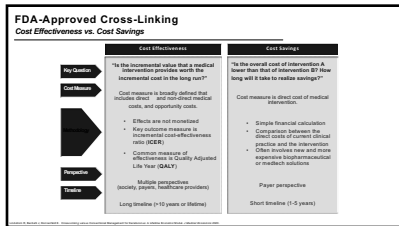
Cost-Effectiveness: Microsimulation Model

Patient-level discrete-event microsimulation model cycles thousands of individuals over the lifespan through a simulated real-world environment.

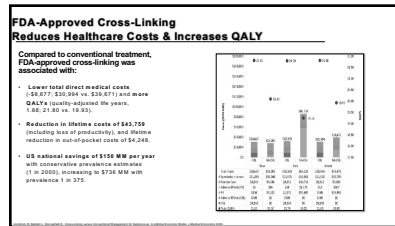
- Simulates modeling of complex individual patient and eye outcomes on progression
- Compares clinical and health outcomes and quality of life between intervention and control groups
- Closely resembles randomized controlled trial, over a longer timeframe than possible in a real-life study



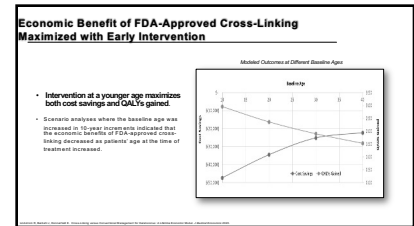
63



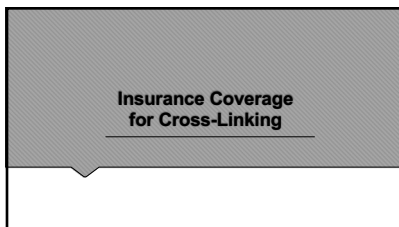
64



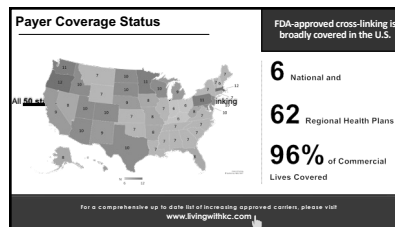
65



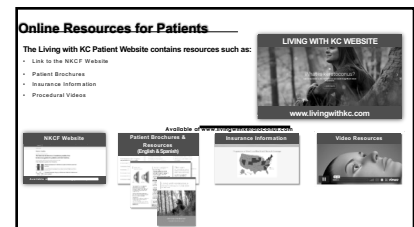
66



67



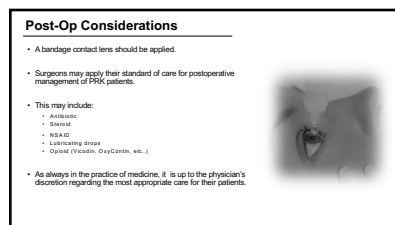
68



69



70



71



72

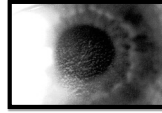
What to Expect with Epi-On CXL

- Week 1
 - PE and sight have
- Month 1
 - Healing of max K value on topography
- Month 3
 - Healing of max K
- Month 6
 - % of flattening of max K at this time
- 1 Year
 - Stabilization
 - Approx 2D or more

73

CXL Complications

- Endothelial cell damage
 - without recovery
- Persistent epithelial defects (epi off)
 - Mechanical, CL, preservatives, topical medication
- Scarring
- Infectious keratitis
 - Fungi, bacteria, HSV, acanthamoeba
 - HSV vs VZV



74

Contraindications

- Corneal thickness <400um
- Prior herpetic infection
- Concurrent infection
- Severe corneal scarring or opacification
- History of poor epithelial wound healing
- Severe ocular surface disease
- Autoimmune disorders

75

Long-term maintenance

- Close monitoring immediately after CXL
 - Every 3 months with pachymetry, HRT and corneal topography
 - Then decrease to yearly to monitor for any progression
- Counseling patient that mechanical rubbing of the eye can cause it to progress
 - Treat allergies
 - Treat DED
 - Treat Blepharitis/MGD

76

Find an Ophthalmologist in Your Area Performing FDA-Approved Cross-Linking

Find a Cross-Linking Expert

Search the directory below to find a cross-linking expert who is familiar with treating progressive keratoconus.

Visit the Find a Physician Locator on the Living with Keratoconus website

LivingwithKC.com

77

Questions?

78

Thank you!



79