

## Case Studies in Ocular Disease: Keratoconus

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No financial disclosures

### Types of Amblyopia

- Refractive
- Strabismic
- Form Deprivation

What is the incidence of keratoconus

Roughly 60-150 per 100,000

What is average age of onset of  
keratoconus?

15.4 years old

Making the Diagnosis

Is a topographer required?

## Diagnosis

- If you don't have a topographer...
- Refraction
- Retinoscopy
- Slit Lamp Findings
- Corneal Pachmetry
- Keratometer
- Quick GP refraction

## Refraction

- Large changes in cylinder
- Shifts in axis
- BCVA not 20/20

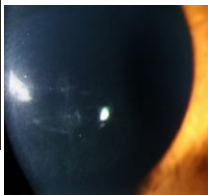
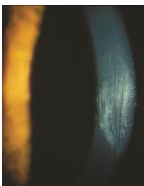
## Retinoscopy findings for keratoconus

### Scissors motion

## Slit Lamp Findings

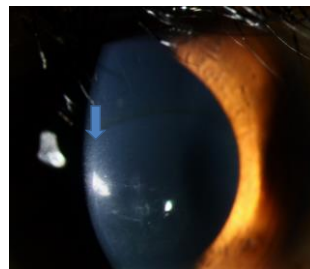
- Vogt's Striae
- Fleisher's ring
- Corneal thinning
- Prominent corneal nerves
- Munson's sign

## Vogt's striae



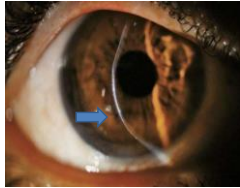
- Stress lines in deep stroma and Descemet's membrane
- Can disappear upon application of mild pressure to lower eyelid

## Fleischer's ring



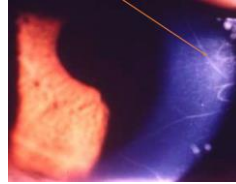
- Iron deposit on epithelium
- Cobalt blue filter might help identifying subtle lines

## Corneal thinning



- Thin cornea at apex
- Increased endothelial reflection

## Prominent corneal nerves



## Munson's sign



## Keratometry findings for keratoconus

Distorted mires

Oval mires

Non superimposable central rings

## Pachymetry findings for keratoconus

Normal cornea 540 Microns but that is central cornea

You want thinnest point of cornea

Do every year on keratoconus patients

## Quick GP VA Check

- Put in a drop of anesthetic
- Apply GP roughly equivalent to BC
- Do VA and OR

## Corneal Topography

- Measures the curvature and shape of the cornea and displays color-coded maps



## Corneal Topography vs. Keratometry – A comparison

**Keratometry measures 4 points on only 3 mm on the cornea**

What do we do after making the diagnosis?

### Worst thing

- Send him to an ophthalmologist
  - OMDs don't know the first thing on CL options
  - Surgical options for keratoconus are limited

### Next in line

- Send him to a fellow optometrists
  - OD will take good care of your patient
  - But who makes the money and who's practice gets built?

### The best

- Do it all by yourself
  - Lots of resources
  - Not as bad as you think

## Refractive Options

- Spectacles
- Contact Lenses
- Surgery

## Options

- Spherical GP
- Hybrid Lens
- Piggyback fit – GP fit over SCL
- Speciality GP fit
- Scleral Lenses

## My Order of Options

- Eyeglasses
- Soft contact lenses
- Specialty GP fit

## Keratoconus Fitting Strategies

- The Easy Way
- The Right Way

## The easy way

- Get patient's chart and call in K's, topo, MR to lab and they will send the first lens

## Next Step

- When lens comes in, apply the lens after instilling topical anesthetic
- After 20 min, check VA and grossly check fit.
- Even if not perfect, send patient home

## Next Step

- After 2-3 weeks, when patient comes back check VA, do take pix of SLE, email to lab
- Do NOT worry about fluorescein patterns or whether the fit looks good --- this is no longer your job
- They will send second lens to you, if needed

## Then...

- Step 5: Repeat this process until done
- With 2 or 3 lenses, you will successfully fit 90% of your patients

## You Will Need One of These



## Best positive motivator

## Its all about the money

- CL Initial Fit: Anywhere from \$1000 to \$1500
- CL materials: anywhere from \$500 to \$800

## Its all about the money

- Billing codes – 92072  
– Initial CL fitting of patient with keratoconus

## Its all about the money

- GA modifier – have sign patient sign waiver

## Its all about the money

- Pray that this patient has Eye Med/VSP

## Its all about the money

- Average keratoconus patient worth over \$1200 for a new fit/diagnosis
- \$400 to \$600 for returning annual patients

## Do the Math

The average optometrist sees at least one patient a month with keratoconus

## Your ideal goal in GP fit...

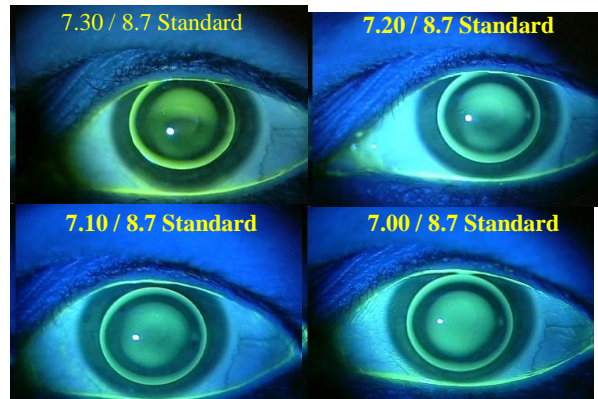
- 3 point touch:
- Minimal bearing (touch) at the corneal apex and an area between the periphery of the lens and the intermediate zone of the cornea
- CLEK study found that most Ods fit too flat

## My Fool Proof Method for Fitting Keratoconus Patients

- Find the steepest point of the cornea
- Find the flattest point of the cornea
- Your lens will be somewhere in between

Here we go...

- Select Base Curve – Flatter of the Two K readings from Topography or keratometer
- Evaluate Fluorescein Pattern – should be too flat. Steepen until you achieve a good 3 point touch



### Next Step

- When lens comes in, apply the lens after instilling topical anesthetic
- After 20 min, check VA and grossly check fit.
- Even if not perfect, send patient home

### Next Step

- After 2-3 weeks, when patient comes back check VA, do OR, and evaluate fluorescein patterns
- In most cases, you will only need to make minor modifications to BC
- Order second lens if needed

### Then...

- Step 5: Repeat this process until done
- With 2 or 3 lenses, you will successfully fit over 90% of your patients

### 3 basic surgical options for keratoconus

- PKP
- Intacs
- Corneal cross linking



## Reasons why patients with keratoconus get sent for surgery

## Risk of perforation

- How often does the cornea perforate?
- Almost never

## Scarring of cornea

- Mostly due to CL abuse and/or improperly fit lens
- As scarring progresses, CL refit can often stop the process. Patients only need surgery if you wait too long to refit them

## Progression of Kconus

- Most of it happens in teenage years
- A few women progress when they are pregnant

## What You Say...

## GP intolerance

- Patient is not able to tolerate CL for the amount of time he/she wishes to wear them

### What I Say...

- The percentage of patients who are truly GP intolerant is WAY over-rated
- I find 1-2 patients a year at the most who are GP intolerant
- The vast majority of them have not been properly fit or prepared for the process

### Ways to avoid GP intolerance

- Make sure patient is properly motivated
- 1. Wait for vision to be bad enough to motivate the patient to work through the discomfort
- 2. Discuss surgery
- 3. Make sure your fees are high enough

### Ways to avoid GP intolerance

- Use large diameter lens
- Be liberal with punctal plugs, artificial tears, and/or allergy drops
- Build up wear time slowly

### Penetrating Keratoplasty

- National Keratoconus Foundation estimates that 10% and 25% of cases will need surgery
- My experience: Less than 2% need a corneal transplant

PKP is second most common transplant done in U.S.

46,000 procedures a year

### Post Op

- Eyedrops for months, years, and sometimes forever
- Fluctuating, hazy vision for months

### Astigmatism after PKP

- The vast majority of patients are left with residual astigmatism
- Refraction may be difficult or imprecise in these patients
- Glasses may not work to correct this astigmatism. GP are often needed to fully restore vision

But...

Definition of Success: Clear graft at 90 days

What is the 1 year survival rate for a cornea after transplantation?

91%

What is the 10 year survival rate for a cornea after transplantation?

60 to 70%

What is the most common reason for a PKP?

Average patient age undergoing PKP

29.5

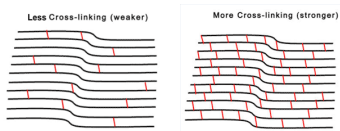
## Intacs



## Intacs

- 65% success rate – defined as a patient being able to get a stable CL fit after the procedure
- 75% of patients obtained at least 2 lines of improvement in both UCVA and BCVA

## Corneal Cross Linking



## Main Goal

To Slow or halt the progression of keratoconus

## Contraindications

- Prior herpetic infections
- Corneal scarring or opacification
- H/O poor wound healing
- Autoimmune disease
- Corneal thinning less than 400 nm

## Postoperative treatment:

- **0.1% prednisolone 3 times/day**
- **Ciprofloxacin 4 times/day**
- **Artificial tears hourly**

## Recommended PO visits

- Day 1 – obvious complications
- Day 3-4 – remove BCL
- 1 month – early refraction
- 3 months - refraction
- 6 months
- 12 months

## Patient Expectations

- Discomfort for several days
- VA return to baseline 2-6 months
- Costs \$3000 to \$4000

## Complications

- **Delayed corneal reepithelization**
- **Infection**
- **Corneal endothelium cell damage – in thin corneas**
- **Keratouveitis**
- **Severe corneal haze**

## Newest variations... epi on

- Much safer and faster recovery for patients
- Will ODs be able to perform?
- Why do the procedure at all – just use Riboflavin drops

## Something to think about...

- Progression is most common in teenagers
- Should surgery really be utilized so young?
- Progression is for a finite period of time. If you fit and refit, eventually patient will stabilize