Diagnosis & Management of Keratoconus

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What is the incidence of keratoconus

Roughly 60-150 per 100,000

What is the cause of keratoconus?

- Unknown
- Biochemically, the eye breaks down collagen fibers faster than it makes them
- Excessive eye rubbing

Classification of Keratoconus

- Classification can be according to :
- Shape :
  1. Nipple Shape (small size 5 mm)
  2. Oval cone (5 to 6 mm)
  3. Globus (large , may involve 75 % of the cornea)

What is average age of onset of keratoconus?

15.4 years old

- If take into account clinical findings, keratoconus is bilateral 96% of times
- If you also take into account corneal topography, it is bilateral 99.75% of times

Initial Diagnosis

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

Refraction

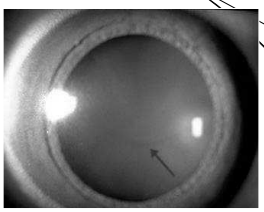
- Large changes in cylinder
- Shifts in axis
- BCVA not 20/20

Retinoscopy findings for keratoconus

Scissors motion

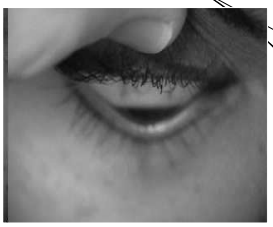
Slit Lamp Findings

Fleischer's Ring:
Annular line demarcating edge of cone



Slit Lamp Findings: Vogt's Striae
Vertical stress lines in posterior cornea

Slit Lamp Findings: Munson's Sing
Bulging of lower lid when looking down



Keratometry findings for keratoconus

Distorted mires

Oval mires

Non superimposable central rings

Pachmetry 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

Why Do We Need Corneal Topography?

- Measures the curvature and shape of the cornea and displays color-coded maps
- The cornea is 2/3 of the refractive power of the eye

Keratometry

Keratometry = 4 points @ 3 mm on the cornea

43.9 D @ 114
43.2 D @ 24

Billing for Topography

- CPT Code: 92025
- Can be done once a year
- Average Reimbursement: $38

Topography: Common ICD-10 codes

- Irregular astigmatism (H52.21-)
- Keratoconus (H18.6-)
- Complications of corneal graft (T85.328)

Refractive Options

- Spectacles
- Contact Lenses
- Surgery

SCL tiers

- Spherical Lens
- Off the rack toric lens
- Made to order toric lens
- Tell patient: may need glasses in addition to the SCL

Options

- Spherical GP
- Hybrid Lens
- Piggyback fit – GP fit over soft hydrogel lens
- Speciality GP fit

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

Its all about the money

- CL Initial Fit: Anywhere from $700 to $1200
- CL Yearly Update: Anywhere from $60 to $200
- CL materials: anywhere from $380 to $700

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

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

Basic Premise

- 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

When are you done?

- When patient is happy with vision
- When lens is comfortable to wear
- When you are as close to 3pt touch as you can be.

Advantages

- You keep all revenue in house
- You are building your own practice and not someone else
- You did it all by yourself!!!!

Acute hydrops

Acute corneal hydrops is caused by the acute disruption of Descemet's membrane in the setting of corneal ectasia.

Hydrops denotes the abnormal accumulation of fluid

Clinical Presentation

Conjunctiva/sclera: Diffuse 1+ injection

Cornea: Inferior conical protrusion, focal area of massive inferior corneal edema with overlying microcystic edema and bullae, epithelium intact, no infiltrates or keratic precipitates

Anterior chamber: Deep, rare cell

Iris: Normal architecture, dilated

How many patients with Keratoconus get acute hydrops?

Roughly 5-10%

Most significant risk factor

Eye rubbing

Acute hydrops

Hypertonic sodium chloride to reduce epithelial edema

Cycloplegic for patient comfort.

Topical steroids to help reduce the inflammation and subsequent neovascularization that can accompany these episodes.

A large diameter bandage contact lens can be placed for comfort.

What are surgical options for keratoconus

In my opinion…

- You should exhaust all options before sending a patient for surgery

3 basic options

- 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

As the cornea thins…

VA degrades, but the risk of perforation doesn't come into play until roughly 350 microns or less

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

GP intolerance

GP Intolerance/Poor fit

- The percentage of patients who are truly GP intolerant is WAY over-rated
- 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. 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

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.

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

Two most important factors in graft failure

- Corneal neovascularization
- Ocular inflammation

What signs should you warn a patient about post PK?

- R – redness
- S – sensitivity to light
- V – vision changes
- P - pain

What is the goal of 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

Main Goal

To Slow or halt the progression of keratoconus

Contraindications

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

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 1-3 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

When considering surgery…

- Is a patient better of getting refit multiple times or surgery?
  - Which is less risky?
  - Progression is usually a finite time period

1:30 left

Eye rubbing is associated with development and progression of keratoconus, with graft rejection, and with acute hydrops

Suggest lubrication and/or allergy drops for all keratoconus patients

1:00

Think about the education we received in optometry school.

You will be bored long term if you only handle simple routine exams and contacts