Diagnostics for The Contact Lens Practitioner Workshop
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Course Abstract:
This workshop will teach practitioners how to read and use a wide variety of diagnostic tools relevant to contact lens practice. It will focus on metrics for diagnosis and management of corneal-based treatments such as orthokeratology and corneal refractive surgery. Featured diagnostic technologies will include topography, tomography, and aberrometry.

Course Learning Objectives:
1. Understand metrics used to diagnose and monitor keratoconus and ectasia
2. Learn methods of corneal evaluation with multiple instruments
3. Learn how to apply these finding to relevant real-world situations with cases

Course Outline:
1. Why care?
    a. Clinical Decisions
        i. Corneal based treatment vs alternatives
            1. Myopia
                a. Early signs?
                    i. Avoid corneal based therapy
                        1. Ortho K alters anterior cornea, removes the ability to early dx with Placido topography
                            a. Alternative therapy
                                i. Atropine
                                ii. Soft MF
                                iii. Defocus spectacle lenses
                    2. Follow up more frequently
                        a. Pediatric population
                            i. KC signs in younger population = more likely have severe disease
            2. Refractive surgery
                a. Corneal based refractive surgery = LASIK/PRK
                    i. Early signs?
                        1. Avoid corneal based surgery
                            a. Possibility of iatrogenic disease
                            b. Alternative surgical options
                                i. Lens-based refractive surgery
                                ii. Forgo elective surgery all together
                        2. Follow up more frequently

b. Prevalence
  i. Prevalence studies
    1. Historical prevalence is 1:2000
      a. Rabinowitz 1998
      b. Kennedy et al 1986
    2. Most recently
      a. Hashemi et. al in 2020 - Worldwide = 1:725
      b. Godefrooij et. al in 2017 - Netherlands = 1:375
      c. Papali'i-Curtin et. al in 2019 - New Zealand = 1:191
      d. Chen et. al in 2020 - Australia = 1:84
    3. Increases in prevalence are related to improvements in diagnostic technology
  ii. KC diagnosis is delayed
    1. Godefrooij et. al in 2017:
      a. Mean dx at 28.3 y/o
        i. Early signs missed
  iii. US Military (Reynolds et. al 2020)
    1. 2001 to 2018
    2. KC is a disqualifier for military enrollment
      a. 18 and older
    3. Reviewed incidence of KC development in an otherwise healthy population
    4. 1:1700
  iv. Chicago School System KC Screening
    1. Started in 2016
    2. Tomography
    3. 2% positive for KC
c. Genetics studies
  i. Fransen E, et al 2021
    1. Candidate genes for KC & Ehlers-Danlos Syndrome genes
  ii. Hardcastle AJ, et al 2021
    1. GWAS collagen matrix integrity and cell differentiation in KC
  iii. Bykhovskaya Y, et al 2021
    1. Update on the genetics of KC
2. **BOTTOM LINE:**
   a. **UNDERSTANDING AND IMPLEMENTING DIAGNOSTICS IS IMPORTANT**
     i. **THESE WILL AFFECT YOUR CLINICAL DECISIONS**
     ii. **THESE AFFECT MORE THAN JUST KC**
     iii. **KC IS MORE COMMON THAN YOU THINK**
3. Simple diagnostic factors to alert for the need for testing
   a. Review of refraction study
     i. Chung et al 2020
       1. Average axis orientation: oblique or ATR
       2. Cyl (refractive or K) > 1.5D should be worked up

      b. Review of retinoscopy study
            i. Al-Mahrouqi et al 2019
                1. Compare retinoscopy to Pentacam BAD D-value findings ≥2.69.
                    a. The results to assess the validity and reliability.
                2. Retinoscope is sensitive for detection even in early KC

4. Topography metrics
    a. Anterior only
        i. Rabinowitz et al
            1. K (Central and Apical) > 47D
            2. IS > 1.4D
            3. Skew (SRAX) > 20deg if >1.5D
                a. Examples
    b. Cases
        i. KC or surface?
            1. Mires matter
        ii. Is is KC?
    c. Clinical pearl:
        i. Symmetry is key!
        ii. Look out for tear film
            1. Corneal staining
            2. Treat and repeat

5. Tomography metrics
    a. Full corneal metrics
        i. Motlagh et al
            1. Curvature (Axial Map)
                a. Same metrics apply
            2. Elevation (Posterior >20>Anterior >15)
            3. Pachymetry (<500)
                a. Examples
        ii. Li et al
            1. Epithelial doughnut pattern
                a. Apical epithelial thinning and peripheral thickening
                b. Max to min thickness: ~20μm
                    i. Examples
    b. Cases
        i. Elevations vs curves
        ii. The KC backside
        iii. Thickness gradient
    c. Clinical pearl:
        i. Topo rules apply to anterior maps
        ii. Adds posterior surface and global pachymetry!
            1. Focal elevations
            2. Thickness gradients

6. Aberrometry metrics

a. Full visual system
    i. Li et al and Kosaki et al
    ii. Higher-order aberrations
        1. Vertical COMA is the predominate aberration
            a. Followed by Trefoil
    iii. Normal vs Suspect vs KC
        1. <0.2 vs ~0.2-0.3 vs >0.3
            a. Examples
b. Cases
    i. The cornea or internal?
c. Clinical pearl:
    i. Sensitive but nonspecific!!
    ii. Coma and trefoil!

7. Combine testing
    a. Cases
        i. Need it all to figure it out
    b. Clinical pearl:
        i. Combine for most accurate
        ii. Think like glaucoma
            1. More findings = more risk
                a. Follow up sooner

8. Photography
    a. Slit-lamp technique demonstration videos
        i. Diffuse illumination
        ii. Direct illumination
            1. Parallel
            2. Optic section
        iii. Sclerotic Scatter
            1. Fiber optic affect
        iv. Specular reflection
            1. Endothelial
        v. Vital dye
            1. NaFl
                a. Filter
                    i. Yellow and blue
            2. Lissamine
                a. Filter
                    i. Red and green
        vi. Anterior chamber assessment
        vii. Retroillumination

9. Monitoring
    a. Worsening of the aforementioned metrics = progression
        i. Refer for treatment with CXL
    b. Suspicious or borderline findings?

    i. Think like glaucoma!!
      1. Complete corneal work up
      2. Avoid corneal based treatments
      3. Follow up frequently
        a. Pediatric population: every 3 months
          i. Progression = immediate treatment with CXL