New Horizons of Dry Eye Technology

David Kading, OD, Katherine Mastrota, OD, Amy Nau, OD, James Wolffsohn, MBA, PhD, Patrick Caroline, Lynette Johns, OD

Dry eye symptoms continue to be one of the primary reason's patients seek eye care. Today, there is little doubt that the condition "dry eye" is a multifactorial disease in which the diagnosis and treatment strategies are made difficult because of the disconnect that often exists between patient symptoms and ocular findings. Therefore, the future of effective dry eye management will most likely need to incorporate new technologies designed to narrow the gap between what our patients describe and the often sub-clinical objective findings.

Objectives

- 1. Better understand innovations in dry eye treatment technologies
- 2. What to expect after treatment with devices
- 3. Understand how Demodex overpopulation leads to clinical signs and symptoms
- 4. Learn to screen keratoconus patients for meibomian gland dysfunction
- 5. Know how contact lenses can contribute to dry eye disease as well as treat it

Contact lenses for the management of ocular surface and dry eye disease

- A. Contact lens wear can contribute to both forms of Dry Eye Disease
 - a. Aqueous deficiency through effects on corneal physiology affecting the feedback to the lacrimal gland to express tears
 - b. Evaporative through the disruption of tear flow, changes tear film composition and friction with eye lids
- B. However, specialty lenses can be an effective solution in ocular surface / dry eye disease.
 - a. Bandage lenses
 - i. Effective use, particularly in combination with dry eye non-preserved topical therapies, has been demonstrated in:
 - 1. Graft versus host disease
 - 2. Sjøgren syndrome including one RCT on silicone hydrogel lenses (Li et al., 2Cornea 2015;34:1072-8).
 - 3. Stevens-Johnson syndrome
 - 4. Over keratoprosthesis
 - 5. Atopic keratoconjunctivitis/allergy
 - 6. Superior limbic keratoconjunctivitis/filamentary keratitis
 - 7. Mucous membrane pemphigoid
 - 8. Limbal Stem Cell Deficiency
 - 9. Exposure and neurotropic keratoplasty
 - 10. Corneal dystrophies
 - 11. Bullous keratopathy
 - b. Scleral contact lens use have only been supported by case series and retrospective chart reviews until a recent RCT of PEG surface-treated compared

to untreated scleral lenses that showed a marked benefit in 20 participants (Mickles et al., Eye & CL 2021;47:308-313). A clinical trial to examine the effect of hyper-oxygen materials (found previously to increase comfort [Dhallu et al., Optom Vis Sci 2020;97:669-75] (in combination with a PEG coating is currently underway.

c. Bandage lenses and amnion: Two studies (Gris et al. Cornea 2002;21:22-7; Saw et al., Br J Ophthalmol 2007;91:1042-7) support the use of bandage soft contact lenses for the retention of amniotic membranes for the treatment of epithelial defects, but they also have a potential role in dry eye. A RCT of bandage soft contact lenses with or without an amnion membrane place beneath is currently underway and will be presented.

Demodex: The Mighty-Mite's natural history and history in disease.

- A. Demodex species
 - a. Demodex life cycle
 - b. Clinical impact of the mite in mammals
- B. Recognizing Demodex in the clinical setting.
 - a. Eyelash evaluation
 - b. Downstream corneal impact of Demodex overpopulation
 - c. Presenting symptoms
- C. Current Demodex overpopulation management strategies and their limitations.
 - a. Lid hygiene
 - b. Tea tree oil
 - c. Other
- D. TP-03. What is it and what is its effect on "acari blepharitis"
 - a. Description of the molecule/drug
 - b. Mechanism of action
 - c. Clinical trial results

Keratoconus, Dry Eye and Meibomian Gland Dysfunction

- A. Keratoconus background
 - a. Decreased visual acuity
 - b. Changes in corneal sensitivity
 - c. Higher rates of blepharitis
 - d. Altered tear parameters
 - e. Low quality of life
- B. Contact lens discomfort in keratoconus
 - a. Suboptimal fit
 - b. Dry eye disease
- C. Meibomian gland dysfunction
 - a. Evaporative dry eye
 - b. Unstable lipid layer
 - c. Pathophysiologic mechanisms-unknown
 - i. Incomplete blink

- ii. Lid margin detritus
- iii. Biofilm
- iv. Cosmetics
- v. Contact lenses
- D. Contact lens wear ocular findings
 - a. Abnormal meibum
 - b. Frequent conjunctival hyperemia
 - c. Lid margin telangiectasia
 - d. Posterior lid margin hyperemia
 - e. Gland obstruction
 - f. Anterior progression of the mucocutaneous junction
- E. Cross-sectional study evaluating keratoconus patients and structure and function of meibomian glands
 - a. Review of study highlights
 - b. Screening and practice
 - c. Targeted intervention

Innovative Dry Eye Technology

- A. Diagnostic devices
 - a. Intended purpose
 - b. Goal of having devices
 - i. Devices are not just for show, they need to bring ROI for treatment as well as for the practice
 - c. What info to look to change
- B. Treatment technologies
 - a. Medications
 - i. Steroids
 - ii. Immunomodulation
 - b. Serum Tears
 - c. Amniotic Drops
 - d. Thermal Pulsation
 - i. What is out there
 - ii. What to expect
 - e. IPL Treatments
 - i. What is this targeting
 - ii. What to expect from this treatment.
 - d.