Innovative Innovations for Optometric Practice (2 hours)

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Summary

Eye care is experiencing rapid innovation which will improve patient care. As such, it will become increasingly important to understand how these technologies will be incorporated into clinical practice. This course will review new diagnostic and therapeutics and how they will play a critical role in clinical care.

Learning Objectives

1) Understand new tear diagnostics
2) Discuss advances in age related macular degeneration monitoring and treatments
3) Understand advances in meibomian gland dysfunction and ocular surface inflammation
4) Discuss advances in therapeutics for presbyopia, ptosis and thyroid eye disease
5) Understand imaging advancements in eye care
6) Discuss genetic testing and its role in keratoconus

Outline

1) Evolving eye care platform
    a. How do you assess new technologies?
        i. What does it do?
            1. If diagnostic, what will it measure?
            2. If therapeutic, what does it treat and how does it work?
            3. If managing practice, how does it change current process?
        ii. How will it help improve patient care?
        iii. What does it cost?
    b. How do you implement new technologies?
2) New Dry Eye Diagnostics
    a. InflammaDry
        i. Measures matrix metalloproteinase-9 levels
        ii. Below 40ng/mL is undetected
        iii. Above 40ng/mL is a positive result
        iv. Grading scales have now been employed to grade the signal strength
            1. Signal strength is based on concentration of MMP-9
    b. Trukera
        i. Measures tear osmolarity
        ii. Advancement of the tearlab testing platform
    c. Tear Based Point of Care Tests
        i. Lactoferrin

1. Lactoferrin levels below 0.9ug/mL are below normal range
2. Low levels of lactoferrin are associated with dry eye

ii. Immunoglobulin E (IgE)

1. Greater levels of IgE indicate allergic eye disease
2. Greater than 80ng/mL is indicative of allergic eye disease

3) New Age Related Macular Degeneration (AMD) Diagnostics
   a. Appropriately characterizing severity of AMD
      i. Drusen
      ii. Early AMD
      iii. Intermediate AMD
      iv. Advanced AMD
   b. Home monitoring systems
      i. Preferential Hyperacuity Perimetry (PHP)
      ii. Patient performs test on a daily basis and results are sent to monitoring center
      iii. Clinician is informed of the results from monitoring center and if any changes are occurring
4) New AMD Treatments
   a. Pegcetacoplan injection
      i. Targets C3 and C3b in complement pathway
      ii. Demonstrates reduction in geographic atrophy lesion growth
      iii. Is currently available and approved through the FDA
   b. Avacincaptad Pegol injection
      i. Targets C5 in the complement pathway
      ii. Demonstrates reduction in geographic atrophy lesion growth
      iii. Is not currently FDA approved
5) New IOP, Visual Field and Macular Pigment Optical Density Devices
   a. iCare Home2
      i. Allows patients to measure intraocular pressures at home
      ii. Can be measured in supinated position
      iii. Based on rebound tonometry which is commonly utilized in office
   b. Wearable visual field devices
      i. Several devices currently available
      ii. Heru
      iii. Olleyes
      iv. Radius xr
      v. M&S Technologies
   c. Zx Pro
      i. Measures macular pigment optical density (MPOD)
      ii. Is handheld
      iii. Helps identify risk factor for macular degeneration
      iv. New literature demonstrates that MPOD may have an important role in computer vision syndrome and symptoms associated with it
6) New Meibomian Gland Dysfunction Treatments

a. Eye Lipid Mobilizer (ELM)
    i. Device that is utilized at home
    ii. Simultaneously warms the lids, provides microvibrations to help liquify meibum and provides vibrations along the outer nasal portion to stimulate tear production through activation of the trigeminal nerve
    iii. Will be fit for the patient at the eye care providers office
    iv. Not currently available
b. AZR-MD-001
    i. Selenium sulfide, a keratolytic agent
    ii. Not currently FDA approved
c. Miebo
    i. Recently FDA approved
    ii. Is 100% perfluorohexyloctane

7) Presbyopia Eye Drops
    a. Several companies are looking at various mechanisms of action to reduce pupil size to extend depth of focus for presbyopes
    b. Pilocarpine
        i. 1.25% is currently FDA approved for presbyopia
            1. Is now approved as a BID dosing regimen
        ii. Several other concentrations are being investigated
    c. Aceclidine
        i. Cholinergic agonist
        ii. Has a low affinity for cholinergic receptors on sphincter muscle
    d. Carbachol
        i. Cholinergic agonist
        ii. It is being investigated in combination with brimonidine
    e. Phentolamine
        i. Is an alpha adrenergic antagonist
        ii. Is being investigated in combination with pilocarpine
8) Controlling ocular surface inflammation
    a. Rinsada
        i. Irrigating eyelid retractor
        ii. A single rinse with Rinsada reduced MMP-9 levels on ocular surface compared to standard rinse
    b. Lifitegrast 5%
        i. Commercially available as xiidra
        ii. Lymphocyte function associated antigen-1 antagonist
    c. Reactive Aldehyde species
        i. Future of controlling inflammation
        ii. Modulates levels of aldehyde which are a byproduct of inflammation and also amplifies inflammation
        iii. Modulating the levels of aldehyde reduces inflammation
        iv. Not yet FDA approved
    d. Cyclosporine

i. Immunomodulatory
ii. Clinically available as two concentrations
    1. 0.05% Restasis
    2. 0.1% Klarity-C Drops PF
    3. 0.1% Verkazia
        a. Preservative free unit dose vials
    4. 0.1% - water free formulation
    5. 0.09% Cequa
        a. Delivered in a new intelligent drug delivery mechanism
        b. Increases penetration into tissues

9) Optical Coherence Tomography (OCT) Angiography
    a. What is angiography with OCT
    b. How does it work
        i. Multiple images of same tissue
        ii. Images are compared by software
        iii. Any part of image that is different is moving blood
        iv. Allows visualization of the blood vessels
    c. Glaucoma care
        i. Allows vessel density measurements
        ii. Allows comparison over time as an additional measurement
    d. Retinal care
        i. Macular degeneration
            1. Allows visualization of neovascularization within the retinal
        ii. Diabetic care
            1. Vessel density
            2. Foveal avascular zone (increases in diabetic patients)

10) Imaging Updates
    a. Confocal scanning retinal imaging (CSRI)
    b. Allows more closely tracking disease
    c. Progression analysis through flicker functionality
        i. Intelligent software automatically overlays images of two different time points and alternates them to determine small levels of change overtime

11) Genetics and Keratoconus
    a. Keratoconus is a polygenetic disease
    b. Saliva sample that is collected can now determine level of genetic risk based on polygenic risk score

12) New Thyroid Eye Disease Treatment
    a. Normal thyroid function
        i. Thyroid stimulating hormone (TSH) is produced by the pituitary gland
        ii. TSH triggers thyroid to produce T3 and T4
        iii. Iodine is utilized to create T3 and T4
        iv. Normally, T4 acts on the pituitary gland in a negative feedback loop to control the level of TSH secreted from the gland
    b. Abnormal thyroid function

i. Hyperthyroidism
    1. Excessive T3/T4 being produced
    2. Can be the result of autoimmune condition
    3. Grave's disease
ii. Hypothyroidism
    1. Reduced levels of T3/T4 being produced

c. Characteristics of thyroid eye disease (TED)
    i. Immune cells attack orbital tissue
    ii. Most of the time associated with hyperthyroid, but can be seen with hypothyroid and euthyroid
    iii. Two phases
        1. Active
            a. Inflammatory phase
            b. Can last about three years
        2. Inactive
            a. Characterized by fibrosis and lasting sequelae of condition
    iv. Orbital fibroblasts – specialized cells in the orbit
        1. Receptors on cell when activated cause downstream ramifications of TED
            a. IGF-1R
            b. TSHR
    v. Clinical manifestions of TED
        1. Eyelid retraction
        2. Eye protrusion / exophthalmos
        3. Eyelid and conjunctival hyperemia
        4. Inflamed extraocular muscles
        5. Compression of optic nerve at orbital apex
        6. Increase in orbital tissue and fact
        7. Gaze evoked orbital pain and diplopia

d. Treatment options for thyroid eye disease
    i. Traditional
        1. Corticosteroids
        2. Orbital decompression
    ii. New treatment
        1. Teprotumumab (Tepezza)
            a. 8 infusions every 3 weeks
            b. Improved proptosis, diplopia
            c. Improved orbital swelling

13) Non-surgical lid lifting
    a. Oxymetazoline hydrochloride ophthalmic solution 0.1%
    b. Commercially available as Upneeq
    c. FDA approved as qd dosing regimen for acquired blepharoptosis