Paradigm Shifts in Presbyopia – Understanding Advances in Topical Treatment Innovations

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Summary

This course will cover an overview of the anatomy, pathophysiology, and impact of untreated presbyopia on quality of life. A discussion of treatments for presbyopia will include advances in contact lenses and topical therapeutics.

Learning Objectives

1) Understand the pathophysiology of presbyopia
2) Discuss contemporary contact lens options
3) Understand current and emerging topical therapuetics

Outline

1) Pathophysiology
    a. The near Triad
        i. Accommodation
        ii. Convergence
        iii. Pupil miosis
    b. Loss of lens elasticity
        i. Nucleus of lens is softer than cortex in younger ages
        ii. In the 30's, nucleus and cortex are similar
        iii. During presbyopia, nucleus is firmer than the surrounding cortex
    c. Lenticular heat denaturation
        i. Heat may denature proteins in an accelerated fashion
        ii. Cataracts develop sooner in locations with warmer climates
        iii. Presbyopia develops at an earlier age in populations living in warmer climates
2) Impact on patient
    a. Onset is typically between the ages of 40 and 45 years
    b. 120 million patients affected in the United States
    c. 1.8 billion patients affected globally
    d. Loss of near vision ranks highest on the effects on quality of life
    e. Carries a psychological burden
        i. Frustation
        ii. Fear
        iii. Confusion
        iv. Depression
        v. Disruption
3) Overview of current options
    a. Glasses
    b. Contact lenses

c. Intraocular lenses
d. Corneal inlays
e. Refractive surgery

4) Contact lens options
    a. Single vision distance
        i. Correct near vision with reading glasses
        ii. Under correct distance vision
    b. Monovision
        i. Select dominant eye
        ii. Understand difference between sighting and sensory dominance
            1. Sighting dominance
            2. Sensory dominance
                a. Patient wears best corrected vision
                b. Place positive power lens (+1.25 or +1.50) over each eye
                c. Which ever eye it is over that disrupts distance vision most is dominant eye
        iii. Under correct non-dominant eye
5) Multifocal lenses
    a. Based on the principle of simultaneous vision
    b. New options for presbyopia correction options
        i. Daily disposable options
            1. Silicone hydrogel advances
        ii. Correcting astigmatism and presbyopia
            1. New monthly disposable options
    c. Challenges with simultaneous vision optical alignment
        i. Patients line of sight is typically nasally offset within the pupil
        ii. The pupil is typically offset nasally
        iii. Soft lenses when aligned centrally can create challenges to optical alignment
    d. Offset Optics
        i. Visual axis is often not through the center of the pupil
        ii. Contact lens centration is estimated based on lens centration on the cornea
        iii. Increased likelihood to have multifocal optics de-centered temporal to patients line of sight
            1. OptiSync design
                a. Soft lens with nasally de-centered optics
                b. Stabilized with a prism ballasted design
            2. Scleral lens options
                a. Optics are decentered nasally
    e. Soon to be available option
        i. APIOC lens
        ii. Has stabilizing crest that stabilizes the lens with the assistance of the lid wiper
        iii. Distinct optical zones for distance, intermediate and near focus

iv. Currently being studied

6) New Options
    a. Pupil modulating agents
        i. Dilator modulator
            1. Brimonidine
                a. Alpha-2 adrenergic agonist
                b. Prevents pupil dilation
                    i. Acts on the Alpha-2 receptor on the pre-synaptic nerve ending to the dilator muscle
                    ii. Prevents release of norepinephrine from the nerve ending
                    iii. Prevents activation of the dilator muscle
            2. Phentolamine
                a. Alpha adrenergic antagonist
                b. Acts directly on the alpha receptors on the dilator muscle to prevent pupil dilation through inhibition at the receptor
        ii. Sphincter modulator
            1. Pilocarpine
                a. Cholingeric agonist
                b. Activates sphincter muscle reducing pupil size
                c. Has activity on the ciliary muscle as well
                d. Two currently approved formulations
                    i. 1.25% pilocarpine
                        1. Approved as once a day or twice a day
                    ii. 0.4% pilocarpine
                        1. Approved as once a day or twice a day
                        2. Packaged in unit dose vials
            2. Carbachol
                a. Cholingeric agonist
                b. Activates sphincter muscle reducing pupil size
                c. Has activity on the ciliary muscle as well
            3. Aceclidine
                a. Cholingeric agonist
                b. Activates sphincter muscle reducing pupil size
                c. Has a known lower level of activity on the ciliary muscle
        iii. Combination agents
            1. Carbachol and brimonidine
            2. Pilocarpine and phentolamine
            3. Aceclidine and brimonidine

7) Case reports
    a. Demonstrate technologies utilizing case presentations