Financial Disclosure

- Honoraria
  - Kenin
  - Nicox
  - Review of Optometry
  - Optometric Management
  - VSP
- Scientific Advisory Boards
  - Zeavision
  - Carl Zeiss Meditec
  - Thrombogenics
- Proprietary Interests
  - None

Course Goal

To provide an overview of LV Rehabilitation options in contemporary practice.

Course Objectives

- Epidemiology
  - Global Impact of LV
  - Prevention of AMD
  - Early Detection and Treatment
- Low Vision Rehab Evaluation
  - Optical Devices
  - Non-optical Devices and Services
- Case Studies

Financial Disclosures

- I have no proprietary interest in any low vision technology, test, or product.
- Therefore, no Low Vision course specific relevant financial relationships to declare.

Low Vision Rehabilitation

In Persons Living With Retinal Disease

Not Your Grandpa’s Low Vision Course

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Retinal Disease: A Global Problem

- Age-related macular degeneration (AMD)
- Diabetic retinopathy (DR)
- Retinal Vascular Disease (CRVO, CRAO, OIS, etc)
- Retinitis Pigmentosa (RP)
- Other Photoreceptor Dx.
  - e.g. Cone Dystrophy
- Retinal detachment

Projected Prevalence of Advanced AMD* in the United States


Prevention

Early Diagnosis

Early Intervention

Improved Visual Outcomes

Pizzi’s 4 Pillars of Wellness

Reach/maintain ideal weight

Healthy Diet

Supplementation

Physical Activity

A Nutritional Approach

AMD Risk Factors

- Age
- Gender - F > M
- Family History
- Advanced AMD
- Smoking
- Iris Color - lighter iris
- Obesity
- CV Disease
- Poor nutrition
- Physical Inactivity
- Low Macular Pigment Optical Density (MPOD)
- Dietary and Serum Levels - Complex analyses (most, but not all) show a relationship.
- MPOD: Most (but not all) studies have shown reduced MPOD in AMD (by multiple measurement techniques).
Macular Pigment Optical Density (MPOD)

HFP

Risk assessment, early detection and monitoring of AMD

- Macular Pigment Optical Density (MPOD)

Xanthophylls and AMD

- Lutein and zeaxanthin form macular pigment
- Dietary sources include green leafy vegetables and orange-yellow fruits
- Act as antioxidants and blue light screening compounds

Zeaxanthin

Macular Pigment Optical Density (du)

<table>
<thead>
<tr>
<th>Level</th>
<th>Low</th>
<th>Average</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.1- 0.25</td>
<td>0.25- 0.45</td>
<td>&gt; 0.45</td>
</tr>
</tbody>
</table>
Dietary Lutein and Zeaxanthin: Eggs have high bioavailability.

Supplementation for Prevention and Tx of Early AMD

1. A quality broad spectrum antioxidant daily multivitamin
2. Lutein (4-8mg) and Zeaxanthin (8-16 mg)
3. Omega-3 fatty acids
   • (DHA + EPA= 1000 mg)

Supplementation for Tx of Moderate AMD

- AREDS 1
- vs
- AREDS 2

Daily Dosage in AREDS 1
Supplements were manufactured to have the following minimum contents:

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antioxidants</td>
<td></td>
</tr>
<tr>
<td>Beta-carotene</td>
<td>15 mg</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>500 mg</td>
</tr>
<tr>
<td>Vitamin E</td>
<td>400 IU</td>
</tr>
<tr>
<td>Essential Trace Elements</td>
<td></td>
</tr>
<tr>
<td>Copper</td>
<td>2 mg</td>
</tr>
<tr>
<td>Zinc</td>
<td>80 mg</td>
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</tbody>
</table>

Daily Dosage in AREDS 2
Supplements were manufactured to have the following minimum contents:

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage</th>
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</thead>
<tbody>
<tr>
<td>DNH/EPA</td>
<td>350/650 mg</td>
</tr>
<tr>
<td>Lutein/Zeaxanthin</td>
<td>10/2 mg</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>500 mg</td>
</tr>
<tr>
<td>Vitamin E</td>
<td>400 IU</td>
</tr>
<tr>
<td>Essential Trace Elements</td>
<td></td>
</tr>
<tr>
<td>Copper</td>
<td>2 mg</td>
</tr>
<tr>
<td>Zinc</td>
<td>40 mg</td>
</tr>
</tbody>
</table>

And the winner is...
AREDS 2
Despite our best efforts, retinal disease may result in low vision.

What is low vision?
- The term "low vision" refers to visual function that is not adequate to meet a person's everyday needs.

Vision Rehabilitation
- We cannot restore lost sight.
- Maximize the use of residual vision in order to lead as independent a lifestyle as possible.

Integrated Treatment in Low Vision Care
- Health/Eye Care Team
  - Optometrists are part of an overall health care team that includes:
    - Other health professionals (PCP, Endocrine, Retina)
    - P_______ is the central member of the team
  - There must exist an environment of collegiality among team members that is mutually respectful, trustful, and non-competitive.
  - Information needs to flow freely among members of the health care team.

The Low Vision Exam
- The Low Vision Eye Exam is usually performed by an optometrist.
  - History
    - Ocular/Medical
    - Functional
  - Visual Acuity
    - logMAR chart
    - Feinbloom
  - Refraction
    - Trial frame
  - Binocularity/Motility Evaluation
  - Visual Fields (Perimetry)
  - Contrast Sensitivity
  - Ocular Health
Measurement of Visual Acuity

- Snellen
  - 20 feet
- ETDRS
  - 4 meters
  - 4/40 M
- Feinbloom
  - 10 feet
  - 10/160 FB

Task-orientated Approach

- Near Tasks
  - Low Vision (LV) device options (aids)
- Intermediate Tasks
  - LV device options
- Distance Tasks
  - LV device options
  - Magnification for distance

Stand Magnifiers

Microscopes

Hand Magnifiers

Near Activities

- Reading
- Cooking
- Adjusting thermostat
- Identifying and taking medicines
- Eating
- Personal grooming
- Looking at photographs
- Hobbies
Hand Held Magnifiers

Determination of Power Needed to Achieve Desired Near VA

\[ M = rF \]
\[ M = \text{reference/goal} \]

- \( M \): Magnification needed
- \( r \): Reference distance in meters
- \( F \): Dioptric power needed

Example

- A patient reads 2 M at 40 cm (1 M~20/40)
- Goal acuity is 1M
- \( M = \text{reference VA/goal VA} \)
- \( M = 2 \) M/1 M
- \( M = 2 \) times the power
- \( M = rF \) solve for \( F \)
  - \( 2 = .4F \)
  - \( F = +5 \) Diopters

Achieving Desired Visual Acuity at Near

- High powered reading additions
- 1/2 eye prisms
- Hand held magnifiers
- Stand magnifiers

Considerations for Prescribing

- Field of view
- Patient’s manual dexterity
- Weight of device

Illuminated Stand Magnifiers
Stand Magnifiers

Distance Activities
- Spotting bus numbers
- Seeing neighbors
- Watching birds or pets
- Watching children at play
- Seeing house numbers
- Reading signs
- Seeing traffic signals
- Seeing faces

Telescopes
- Spotting distant objects
- May be hand-held or spectacle-mounted

Determination of TS Power Needed to Achieve Desired VA at Distance

\[ M = \frac{BVA}{TA} \]

- \( M \) = Magnification needed
- \( BVA \) = Patient's best-corrected acuity
- \( TA \) = Target acuity

Example
- Patient \( BVA = 20/200 \)
- Goal VA = 20/40
- \( M = \frac{200}{40} = 5x \)

PRE-MADE TELESCOPES
Keep in mind…

- A $2,500.00 speculate TS may soon become useless if the condition (Wet AMD, PDR) worsens.
- HHTS, hand/stand mags, HE/FFMS are lower cost alternatives.

Contrast Defects

Glare Control

- Tints are person/task specific, not disease-specific
- Indoor tints
- Outdoor tints

Light Sensitivity

- Filters
  - Corning, NoIR
  - Corning 527, 550

Adequate Lighting

- Increasing contrast by increasing lighting
  - Ott-lite
  - Luxor Light

Non-optical Devices

- Activities of daily living
  - Large button phone
CASE: ANGIOID STREAKS

- Note Angioid Streaks radiating from the optic disc and macular laser scarring

LOW VISION DEVICE

- Eschenbach illuminated stand magnifier

CCTV

Case Summary

- Given the extensive scarring and concurrent presence of Diabetes, a simple approach to devices is best.
- We provided a combination of distance and near aids with an emphasis on ease of use, portability, and wide field of view.

Low Vision Rehabilitation

- Prognosis:
  - Distance
    - excellent for spotting and distance viewing with telescopes
  - Near
    - Excellent for spotting and large print reading
    - Fair for standard print, depending on contrast.
QUESTIONS AND DISCUSSION

Vision “Restoration”

- Bio-technological approaches to restore vision recently have been featured in the media and the literature.
  - Implantable Miniature Telescope™ (IMT)
  - Artificial Retina Prosthesis
  - Precursor Retinal (Stem) Cell Transplantation

**Implantable Miniature Telescope™**

- Miniature (4mm long x 3.6mm diameter) TS set within PMMA carrier.
- A Visual Prosthetic Device (not an IOL) that is designed for monocular implantation.

- FDA approved for patients > 75 with end-stage AMD.
- IMTS replaces crystalline lens in 1 eye, providing central magnification.
- Fellow eye used for peripheral vision. (modified mono)
- IMTS directs light onto functional tissue.
- 90% showed at least a 2-line improvement in BCVA.
- n = 219 patients
- Risks include corneal edema/decompensation.

**Implantable Miniature Telescope™**

- Surgical implantation of the IMT is more difficult than cataract surgery, requiring a 10-12mm limbal incision to insert the device.

- Mag | Field of View
  - 2.2x | 9.2 deg
  - 2.7x | 6.6 deg

James Gilman, CRA
Vision Restoration

- Implantable Miniature Telescope™ (IMT)
- Retina Prosthesis
- Precursor Retinal Cell Transplantation

Microelectric Retinal Implants

- Vincent Chow and Dr. Alan Chow invented a microelectric subretinal implant, Artificial Silicon Retina (ASR®).
- Optobionics (www.optobionics.com)

Argus II Retinal Prosthesis

Approved for RP Patients

The Argus II System works by converting video images captured by a miniature camera housed in the patient’s glasses into a series of small electrical pulses that are transmitted wirelessly to an array of electrodes on the surface of the retina. These pulses are intended to stimulate the retina’s remaining cells, resulting in the corresponding perception of patterns of light in the brain. The patient then learns to interpret these visual patterns, thereby regaining some visual function.

Argus II Epiretinal Implant

Video camera images sent to electrodes.

Vision Restoration

- Implantable Miniature Telescope™ (IMT)
- Artificial Silicon Retina
- Precursor Retinal Cell Transplantation

Retinal Stem Cell Transplantation

Clump of cells inserted within host retina. The cells are healthy but are isolated from the rest of the retina.
**Summary of Key Points**

- As the population ages, retinal disease will become more prevalent.
- Optometrists have a primary role in prevention, detection management/co-management, and rehabilitation.
- We can enhance the lives of patients by prescribing low vision optical devices.

**Conclusion**

- We must keep our eyes on the ultimate goal: a well adjusted, empowered, optimally functioning person who has overcome the challenges that retina-related vision loss poses.

**Thank you!**

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