Ride the Wave of Technological Innovations in Eye Care

David I. Geffen, OD, FAAO

Consultant/Advisor/Speaker

- Accufocus
- Alcon
- AMO
- Annidis
- Bausch + Lomb
- Bruder Healthcare
- EyeBrain
- Optovue
- Revision Optics

Stem Cell Technologies
Limbal Stem Cell Deficiency

Sequelaes
- Persistent epithelial defects
- Corneal scarring and ulceration
- Conjunctivalization of the cornea
- Severe visual loss
- Chronic pain
- Keratoplasty failure

Limbal Stem Cell Transplantation

Procedures

Donor
- Conjunctival limbal autograft

Autograft
- Fellow eye

Allograft
- Living-related conjunctival limbal allograft
- Relative
- Keratolimbal allograft
- Cadaver

Keratolimbal Allograft

Donor
Recipient

S/P Tube Shunt
S/P KLAL
S/P PK
VA 20/30

Stem Cell Coated Contact Lenses

- Aniridia patients
- Contact lens overwear?
- Various ocular surface disease issues:
  - Steven's Johnson syndrome
  - Ocular pemphigoid
  - Graft Vs Host
  - Chemical burns

Sensimed Triggerfish lens:
Diurnal IOP measurements
Glucose Monitoring Contact Lens

PROKERA®
- Class III medical device comprising of CRYOTEK™ amniotic membrane into a thermoplastic ring set
- Combines the functionality of a symblepharon ring with the biologic actions of CRYOTEK™ amniotic membrane to create a unique treatment option for corneal and limbal wound healing

The Amniotic Membrane
- The amniotic membrane is the innermost lining of the placenta (amnion)
- Amniotic membrane shares the same cell origin as the fetus
  - Stem cell behavior
  - Structural similarity to all human tissue
  - Avascular like the cornea

RPE Tissue Regenerated from Pluripotent Skin Stem Cells
Point Spread Function
Refracting in PRACTICE
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Refraction
• Over 100 years the same method
• Confusing for the patient
• Inaccurate
• Low Tech

20/20 is not Vision Optimized!

PSF Refraction Is More Sensitive
• Changes in 0.05D are now noticeable
Generates More Accurate Rx

- **Subjective refraction** – not auto-refraction
- **Point Spread Function technology** attains a higher level of sensitivity and accuracy
- **PSF refines the Rx end point to 0.05D, 5X better than phoropters**

Maximum Plus Maximum Visual Acuity

- **Prevention of over-minus due to the true perception of the PSF and the target detail** versus using Snellen optotypes which requires one self to determine their own visual stress point of smaller and darker.

- With the Vmax system if the patient is over-minused, the target simply looks blurry again. This allows for a decrease in the level of patient frustration by having an un-ambiguous which yields a higher level of clinical confidence. Confidence in the refraction was found to 95% amongst patients achieving identical or better refraction with the device compared to a manual phoropter.

Preferred by Patients

- PSF Refractor has been clinically proven
- Study with over 900 patients at 7 U.S. Study Locations
- Results published at ARVO 2012
- Significantly positive results when patients were asked to choose the PSF Rx versus the phoropter Rx
The Problem
- Small amounts of binocular misalignment, which result in compensatory eye movements, causing excess visual demand.
- The Vision Council reported that 65% of Americans suffer from symptoms of Computer Vision Syndrome.

Common Symptoms
- Digital eye strain
- Computer Vision Syndrome
- Headache
- Visual discomfort
- Dry eye sensation
- Fatigue
- Stiff neck or shoulders

SightSync (Measurement Instrument)
- Objective, accurate, quick
- Technician performed during pre-screening
- <90-120 seconds

SightSync Output
- Distance: 2.0 Base In
- Near: 2.8 Base In
The Solution (neuroLens)

» Synchronizes binocular vision at all distances, eliminating need for compensating eye movements.
» Progressive prism technology, using measurements from SightSync
» Built into spectacle lenses with patient’s Rx

What current optometric investigators are saying about eyeBrain’s SightSync & neuroLens technology:

» “The most important breakthrough of my career as an optometrist.”
» “One of three WOW factors of my 30 year optometry career — right up there with LASIK and premium cataract surgeries.”
» “It’s literally rejuvenated my desire to practice optometry and it’s driven me to be an even better doctor by having the technology in my practice.”
» “I just can’t believe how many people come in with these symptoms. I went from thinking I might be able to help 3-5 patients a week with these lenses, but now I’m thinking it’s more like 3-5 patients every day!”

EyeGraine: Subgroup of Chronic Daily Headache

» Symptoms
  - Primary Symptoms
    • Frequent Headaches
      • 3+ days per week
    • Neck Pain/Stiffness
  - Secondary Symptoms
    • Dry eyes
    • Fatigue with near work
    • Photophobia, especially at night
      • Headlights

Study Data

Point-of-Care Diagnostics
RAPID PATHOGEN SCREENER

Ability to screen for viral infections

Can detect presence of Adnovirus in conjunctiva

Cognoptix

- Fluorescent Ligand Scanning (FLS)
- Beta amyloid-specific small molecules are dropped into a patient’s eye, which is scanned by the Cognoptix SAPPHIRE instrument
- The small molecules are absorbed into the lens and bind to the amyloid aggregates
- The FLS system excites the fluorescent ligands that bind to amyloid

Technology Overview Tear Lab

- Revolutionary tear collection
  - Non-invasive
  - Gives access to untrained users (CLIA waiver)
  - Integrates into technician workflow
- Novel lab-on-a-chip
  - Less than 50 nl required
- Platform for rapid electrochemical biomarker assays
  - Sample-to-Answer in less than 30 seconds
Tears as an in vitro Diagnostic Platform

- Tears are an ideal matrix for non-invasive testing
  - Derived from blood
  - Largely acellular
- Tears known to have thousands of proteins & genes
  - Potential for many ophthalmic & non-ophthalmic markers
- Biomarker normalization using osmolarity
  - Fundamentally corrects for tear film instabilities
  - More accurate reporting of proteins, genes, metabolites
  - Combines multiple markers & payments on a single chip

Osmolarity in Diagnosis & Grading of Dry Eye

Future of Tear Biomarker Analysis: TearLab Next Generation Platform

- Quantitative
- Rapid testing (<2 minutes)
- Multiplexed biomarkers
- EHR integration
- Clinical Application:
  - Normalization using osmolarity
  - Customized chips with designed sensitivity & specificity

Tear Film Instability Increases With DED Severity

TearLab Next Generation Platform

- When?
  - CE Mark by end of 2016
  - 510k submission in early 2017
  - First test will have osmolarity + 1 or 2 additional markers
  - Likely to be focused on inflammation
  - New iterations possible every 6 months
Presbyopia Correction

- Accommodating IOLs
- Corneal Inlay Technology
- Therapeutic treatment

Surgical Procedure

- Description: A femtosecond laser creates a pocket in the stroma at a depth of 200-250μm with femtosecond laser spot line settings of <6x6 or equivalent is recommended.

Pocket Emmetropic KAMRA (PEK)

Pocket: 200-250μm

Endothelium

Inlay Design

- Inlay improves near vision by extending depth-of-focus
- Central aperture is a hole in the inlay and has no power
- Inlay provides an unobstructed pathway for focused light to reach the retina

Inlay Design

- Made from Polyvinylidene Difluoride (PVDF)
- 8,400 holes (5-11μm)
- 1.6mm Aperture
- 6μm thick

Depth of Focus Pre-Op & Post-Op

- Several Months Post-op
- AcuTarget HD™ Instrument
Actual patient images courtesy of David Allamby, MD, Focus Clinics London

**Cosmesis**

The inlay may be visible in light eyes from an oblique angle or when a patient has a pupil smaller than 3.8mm in the non-implanted eye.

**RainDrop**

- Phase III clinical trials
- Hydrogel Inlay
- Increases prolate nature of cornea
- Under a femtosecond flap

**Refocus**

- Restarted Clinical trial with redesign of method for creating the tunnels
- Now called the “visibility implant system”

**Topical ‘CURE’ for Presbyopia**

- Eye Therapies
  - Contains miotics but also proprietary components that allow full 12-14 hours of near and far vision
  - Encore Vision
    - Contains drops that selectively target and disrupt the disulfide bonds in the lens
    - Total of 3-4 weeks of treatment and permanent results thus far

**Calhoun Light Adjustable IOL**

- 6 mm silicone optic and PMMA haptic IOL
- Using a UV laser so as to change the refractive error
- Post operative enhancement, correction, adjustment
- Optometry’s role in 8-10 years based on demographics
- 30 Million patients with cataracts within 3 years and increases each year for the next 14 years

**Femtosecond Lasers**

- Cataract & Corneal (LASIK Flap) Procedures
- Surgical activities
Femtophaco makes
Mediocre surgeons good,
Good surgeons better,
Excellent surgeons
exceptional.

ORA System™: Designed to
Optimize Every Cataract Procedure

ORA's new Optiwave™
technology takes intraoperative
wavefront aberrometry to a
new level of precision
providing surgeons a
higher level of confidence

What is Multi-spectral Imaging?
• New and unique way to view layers of the retina non-invasively
• The device uses a series of discrete monochromatic lights to create 12 optical “spectral slices” throughout the entire thickness of the retina
• Provides an unaltered view of the retina including the deep neural architecture of the RPE and choroid
• Allows for early detection of retinal pathology
• Allows you to document, follow, monitor, and treat or refer retinal pathologies with confidence
• Provides an interface for patient education and loyalty

Multi-spectral Imaging
Deep Retinal & Choroidal Views

RHA Multi-Spectral Imaging

The doctor sees all of these images
Conclusions

- Many exciting advances in technology
- Important to be aware of the technologies and apply them to help us practice at a higher level and assist patients
- Patients are more educated than in the past and expect to see doctors who know the answers to their eye care questions and can communicate that knowledge