REFRACTIVE SURGERY: AN OD’S PERSPECTIVE
Marc R. Bloomenstein OD, FAAO
Schwartz Laser Eye Center

DISCLOSURE
• Presenter is on speakers panel of Alcon, Allergan, Bausch + Lomb, J&J, OcuSoft, Reichert
• President of MRB Eye Consultants
• Past-President of the Optometric Council on Refractive Technology (OCRT)
• Presenter has NO financial interest in any products mentioned..well except:

STARBUCKS

PRE-OPERATIVE TREATMENT
What else do we need to look for?

HOW ABOUT THIS?

WOULD YOU TREAT THIS?

EASIER WAY TO START IN-OFFICE
• Use Blephadex swab for initial in office treatment followed by at-home treatment with Blephadex pads or foam
• 3-4 weeks should see reduction in symptoms and obvious demodex load by slit lamp inspection
• Continue to use everyday for maintenance

LIPID EMULSIONS
• 4th generation
• Composed of polar and/or non-polar lipids
  • e.g. phospholipids + triglycerides
• Mode of action
  • Support both the aqueous phase and the lipid layer
  • Tear evaporation is reduced
• All emulsions marketed to date are anionic (negatively charged): electrostatic repulsion

14 MAKE A TRUE TEAR..

15 NEURONASAL STIMULATION
• Indication: For temporary increase in tear production during stimulation in adult patients with Dry Eye
• Dosing: BID + PRN
• Key Claims:
  • Immediate onset of tearing with stimulation
  • Acute tearing with device use
  • Release of mucin with device use
  • Increase of tear film stability
  • Immediate improvement in symptom(s)
• Safe, minor side effects; for home use

17 CORNEAL ISSUES
• Corneal Dystrophies
  • EBMD
  • Anterior or Posterior Dystrophies

• Corneal Degenerations
  • Keratoconus
  • Pellucid
  • Keratoconjunctivitis Sicca

18 REFRACTIVE SURGERY

19 LASIK AND OD’S
• Natural Progression
• Kids to Teens to Young Adults to Adults to Old Peeps!
• Managing LASIK is parallel to contact lens management
• Managing the OSD
• Patients listen to OD’s
• This is a great surgery....

20 **US REFRACTIVE MARKET OVERVIEW**

• US patient pool largely untapped
  • More than half of U.S. population require some form of vision correction
  • Millennial group is the largest generational group with 86 million people, 7% larger than Baby Boomer group
  • ~5 million millennials have had LASIK
  • ~25 million more (5x) are considering LASIK
  • LASIK is the most commonly performed refractive procedure

70 **ARE PEOPLE STILL DECIDING TO HAVE SURGERY......**

71 **BOTOX**

72 **HAIR TRANSPLANT**

73 **VIAGRA ■ CIALIS ■ LEVITRA**

74 **LET’S SEE THE NUMBERS...**

76 **2013 MARKET SCOPE DATA**

• 2013 refractive surgery procedural volume for US/Canada/Mexico approximately 600,000
• Decline of 6.6% from 2012
  • Includes LASIK, surface ablation, phakic IOLs, and refractive lens exchange
• Decline from 1M+ in 2007
• Impact of Baby Boomers, GenX, GenY

77 **2015 REFRACTIVE MARKET STATISTICS**

• Vision correction market in the US:
  • Over 60% require vision correction (nearly 200M people)
  • Spectacles, contact lenses
• Refractive surgery penetration remains at less than 3%
• 600,000 refractive procedures in 2015

78 LVC AND CONSUMER CONFIDENCE INDEX
2001-2010
• Ophthalmology Management, 9/1/2010

79 CONSUMER CONFIDENCE METRICS:
UNIV. MICHIGAN INDEX OF CONSUMER SENTIMENT
• Mar 2016: 91.0
• Sep 2015: 87.2
• Sep 2014: 84.6

80 2015 CORCORAN MARKET ANALYSIS
• “Since it peaked in 2007 at 1.4 million procedures per year, LASIK has declined 50% in the USA, whereas refractive cataract surgery, including presbyopia-correcting intraocular lenses (IOLs), astigmatism-correcting IOLs, and femtosecond laser-assisted cataract surgery, has grown to 350,000 procedures per year, beginning in 2003.”

81 REFRACTIVE OPPORTUNITY: BOOMERS VS. MILLENNIALS
• US Census Bureau Estimates:
  • 75.4 million Baby Boomers in 2014. Ages 51 to 69 in 2015.
  • 74.8 million Millennials in 2014. Ages 18 to 34 in 2015. By 2015 will increase to 75.3 million and become the biggest group.

82 HUFFINGTON POST, 03/22/2016:
NEARSIGHTEDNESS HAS A FAR-REACHING IMPACT AS THE MYOPIA EPIDEMIC SPREADS AROUND THE GLOBE
• Ophthalmology. 2016 Feb 11.
• Global Prevalence of Myopia and High Myopia and Temporal Trends from 2000 through 2050.
• Brien Holden Vision Institute study on the prevalence of
myopia.
• Myopia is projected to affect almost half of the world’s population by 2050 — a sevenfold increase.

83 **HUFFINGTON POST, 03/22/2016:**
NEARSIGHTEDNESS HAS A FAR-REACHING IMPACT AS THE MYOPIA EPIDEMIC SPREADS AROUND THE GLOBE

• 5 billion with myopia.
• 1 billion with high myopia (>6D)
• United States and Canada increase to 260 million, or close to half of the population, up from 89 million in 2000
• High myopia cases increase by five times to 66 million.
• High myopia increased risk of cataracts, glaucoma, retinal detachment and myopic macular degeneration.

84 **MARKET SCOPE: CHINA’S OPHTHALMIC MARKET EXPECTED TO DOUBLE BY 2021**

• EyeWire Today: March 28, 2016
• “China is the world’s largest market for laser vision correction, with a growing epidemic of myopia. Private providers have taken the lead in commercializing refractive surgery, but prospects for growth are dampened by a fall-off in the number of people entering their twenties. Alternative technologies, such as SMILE (small incision lenticule extraction) and phakic IOLs, are getting a toehold in the market.”

• Global refractive surgery market patient fees generate $5.2 billion in 2015 to $6.1 billion in 2020, growth rate of 3.1%.

85 **COMPARISON TO COSMETIC SURGERY FIELD**

1 2015 REPORT BY AMERICAN SOCIETY FOR AESTHETIC PLASTIC SURGERY (ASAPS) REPORT ON SURGICAL AND NON-SURGICAL PROCEDURE STATISTICS

2 • Total Surgical Procedures
• 1997: 900,933
• 2014: 1,688,757
• 2015: 1,912,468
• 7.1% increase 2014-2015
• 94.0% increase 1997-2015

Total Nonsurgical Procedures
• 1997: 740,751
• 2014: 8,898,652
• 2015: 10,879,909
• 22.3% increase 2014-2015
• 605.3% increase 1997-2015

COMPARISON TO COSMETIC SURGERY FIELD
• 2015 Report by American Society for Aesthetic Plastic Surgery (ASAPS)
  • Total Surgical Procedures 2015: $8.1 Billion
  • Age 19-34: 26.8%
  • Age 35-50: 39.5%
  • Women: 90% (1.7 million procedures)
  • Men: 10% (nearly 200,000 procedures)
  • Liposuction most common for both women/men
  • Total Nonsurgical Procedures 2015: $5.8 Billion

USES OF ELECTIVE (ELECTRIC) DOLLARS?
• “We’ve now received more than 325,000 reservations, which corresponds to about $14 billion in implied future sales, making this the single biggest one-week launch of any product ever.”

Tesla email: April 7, 2016

PIXL
Using Technology for the better good...

1998 CROSS-LINKING

CORNEAL CROSS-LINKING (CXL)
• Strengthens/stiffens corneas with UV light and riboflavin
drops
• 98-99% effective*
• Vision loss is progressive

91 □

92 □ WHY RIBOFLAVIN?
• Many different vehicles were discussed and sampled in animal studies
• Aldehyde sugars
• Chemical cross linkers
• Irradiation
• In 1998 the first human was treated with riboflavin and there were no side effects
• Results were confirmed and the rest is history
• Other vehicles being trialed now
  • Decolin with UV-C in Reston, Virgina

93 □ METHODS OF STIFFENING THE CORNEA

 ● Glutaraldehyde crosslinking (prosthetic heart valves)
 ● Formaldehyde (pathology specimens)
 ● Aldehyde sugars (diabetes)
 ● UVA-induced crosslinking (dentistry)

94 □ CXL IS EVERYWHERE

We see
Collagen Cross Linking EVERYWHERE in our world but
NEVER pay attention to it

95 □ OUR WATER SUPPLY IS UV TREATED
CORNEAL CROSS-LINKING

• While the goal of conventional cross-linking for treatment of keratoconus is to stabilize, mean flattening of steepest keratometry is observed in a large percentage of patients

CORNEAL CROSS-LINKING IN REFRACTIVE CORRECTION

Redistribution of Corneal Stress

PIXL

WHAT IS PHOTOREFRACTIVE INTRASTROMAL CROSS-LINKING (PIXL)?

• Corneal cross-linking (CXL) was first introduced in 1998 as a treatment for progressive keratoconus

• Laboratory and clinical studies have demonstrated that CXL stiffens the cornea (alters corneal biomechanics)

• PiXL is the application of zonal CXL using spatial application of uva

• The goal of PiXL is to introduce controlled corneal shape change using patterned UVA CXL, without ablation
PIXL FOR MYOPIA: BASIC PRINCIPLE

- Specific UVA patterning is applied to the center (myopia) of the riboflavin-soaked cornea
- Focal stiffening is achieved in the treatment zone
- Redistribution of biomechanical stresses occurs in response to normal intraocular pressure
- “Bulging” of the cornea in untreated regions results in central flattening: reduction of myopia

PHOTOREFRACTIVE INTRASTROMAL CROSS-LINKING

- UVA patterning is applied to the center of the riboflavin-soaked cornea for treatment of myopia.

  - Theory is to induce focal stiffening in the cross-linked regions, resulting in “bulging” of the cornea in untreated regions in response to the normal intraocular pressure

PIXL TARGET: LOW MYOPES WHO REJECT LVC

- Removal of central 5mm epithelium
- 10 minute Vibex Rapid pre-soak
- 30 mW/cm² irradiation, pulse interval [1,1]
- 4 mm circular spot on corneal vertex
TRANSEPITHELIAL PIXL PILOT STUDY
DR. JULIAN THENG AND DR LIM WEE KIAK EAGLE EYE CTR. SINGAPORE

THERE ARE STILL SOME COMPLICATIONS....
#NOTHINGISPERFECT
#WEARETHERETOMANAGE

CONCLUSION
• LASIK is still King!
• Complications are minor and treatment can be initiated to resolve
• Technology is advancing rapidly, yet the premise is still the same..
• Things old, are sometimes still the best