

“Hey Doc, What’s New?”

An Update of Modern Ocular Disease Management in Primary Eyecare

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1

Disclosures

Dr. Wood:

- **LKC Technologies** – Clinical Advisory Board
- **Alcon** – Contact Lens KOL/Speaker
- **Bausch & Lomb** – Contact Lens Expert/Speaker
- **Essilor Instruments** – LLLT/IPL Speaker
- **Pure & Clean** – Research/Speaker
- **Vision Source Administrator** – San Antonio
- **Vision Source Vendor Relations Consultant** –
 - Equipment/Contact Lens

2

Why Modern Ocular Disease Management Matters in Primary Care

. Changing Landscape of Ocular Care

- Increasing prevalence of chronic ocular diseases
- Growing role of optometrists in comprehensive eye care
- Predicted shortage of ophthalmology for aging population
- Advancements in treatment options and diagnostic technologies

3

Why Modern Ocular Disease Management Matters in Primary Care

. The Role of Optometry in Primary Eyecare

- Early detection and management of ocular diseases
- Collaboration with ophthalmologists and other healthcare providers

4

Case 1:
Primary Open Angle Glaucoma,
Severe Stage,
History of right brain cerebral
vascular accident (CVA)

5

Case 1: Primary Open Angle Glaucoma,
Severe Stage,
History of right brain cerebral vascular
accident (CVA)

Chief Complaint: NP 75yo Hispanic Male presents
for 2nd Opinion concerning surgical management
of severe stage primary open angle glaucoma
(POAG severe)

6

Case 1: POAG, Severe, w/RT Brain CVA

HPI:

1. OMD recommending Xen Gel Stent surgery
2. Patient concerned, does not want surgery
3. IOP elevated at recent OMD glaucoma evaluation
 - IOP 9mo earlier: 10mmHg OU
 - IOP 6mo earlier: 10mmHg OU
 - IOP 2mo earlier: 17mmHg OU
 - IOP 1mo earlier: 19mmHg OD, 18mmHg OS
4. OMD deemed IOP too high, max meds/SLT, not effective

7

Case 1: POAG, Severe, w/RT Brain CVA

HPI:

5. Glaucoma Therapy:

timolol 0.5% qam OU	(generic Timoptic)
bimatoprost 0.01% qhs OU	(generic Lumigan)
brimonidine 0.2% bid OU	(generic Alphagan)
brinzolamide 1.0% bid OU	(generic Azopt)
s/p 6mo SLT 360 OU	

***Began taking Nasocort bid by nose for allergies 3mo ago*

6. Hx of Right Brain CVA 5 years earlier

8

Case 1: POAG, Severe, w/RT Brain CVA

ROS:

Type 2 DM without retinopathy or DME OU, well controlled

Hypertension, well controlled

Hx Right Brain CVA

Allergic Rhinitis

Systemic Meds:

Metformin (T2DM)

Furosemide (CHF/fluid retention)

Lipitor (Hypercholesterolemia)

Eliquis (Blood thinner/AFIB)

Nasocort (Allergic Rhinitis)

9

Case 1: POAG, Severe, w/RT Brain CVA

Initial Exam Results:

BCVA 20/40 OD/OS/OU Distance, NIPH

Pupils/CT/Motilities: Normal OU

Confrontation fields: Superior left side field defect OD & OS

IOP: 13 mmHg OU (Goldmann), 13mmHg OU (iCare)

Pachymetry: OD: 540 microns OS: 538 microns (THIN)

Biomicroscopy: Clear PC IOL OU, other unremarkable

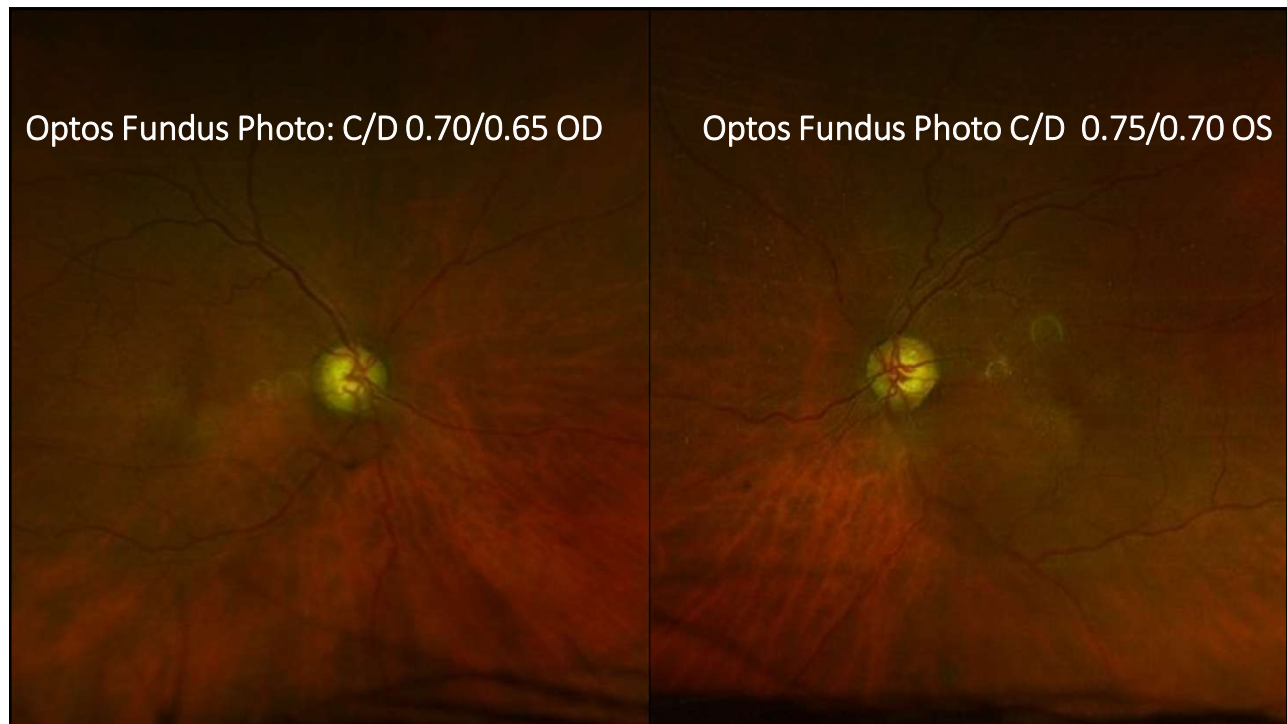
Gonioscopy: Open to Ciliary Body w/2+ pigment all quads OU

DFE: C/D 0.70/0.65 OD, 0.75/0.70 OS, well perfused rim OU

Macula clear without DME

(-) DR OU, mild vascular tortuosity OU (HTN/cholesterol)

10



11

Case 1: POAG, Severe, w/RT Brain CVA

Humphrey 30-VF:

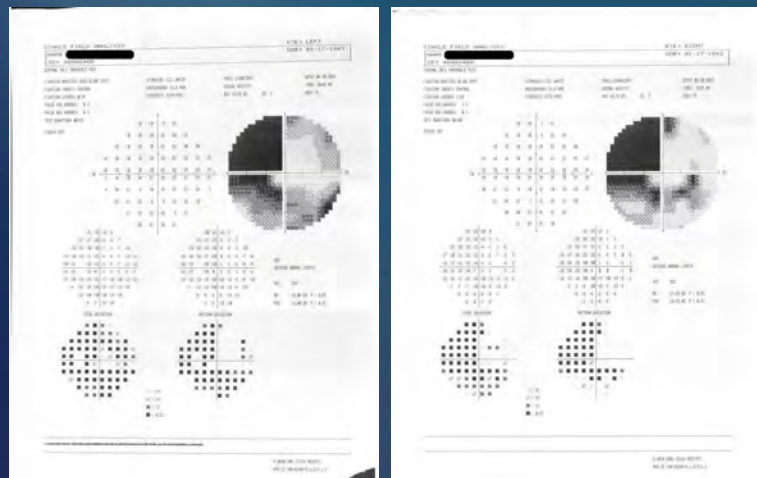
Glaucoma:

Inferior arcuate scotoma

Superior depressions

Right CVA:

**Left side, superior
quadrantonopsia**



12

Case 1: POAG, Severe, w/RT Brain CVA

OCT ONH/GCC OD

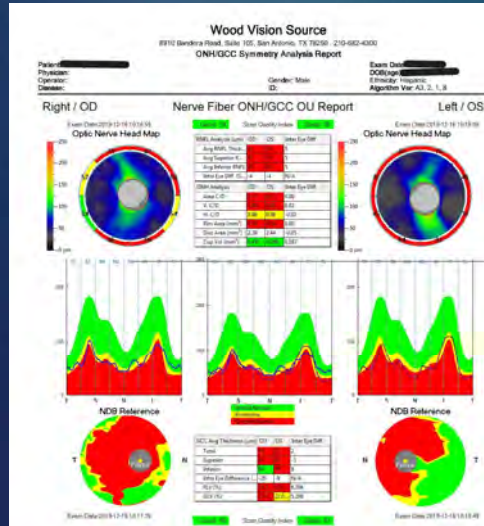
C/D **0.96/0.90**

Disc Area: **2.39**

Avg RNFL: **63**

Total GCC: **74**

Reliability: **Good**



OCT ONH/GCC OS

C/D **0.98/0.88**

Disc Area: **2.44**

Avg RNFL: **58**

Total GCC: **72**

Reliability: **Good**

13

Case 1: POAG, Severe, w/RT Brain CVA

DIAGNOSIS:

- | | |
|-------------|---|
| 1. H40.1133 | POAG Severe OU |
| 2. I63.9 | Cerebral Infarction, Right brain |
| 3. H53.462 | Homonymous Left Superior quadrantonopsias |
| 4. E11.9 | T2DM without NPDR or DME |
| 5. I10 | Essential Systemic Hypertension |
| 6. E78.00 | Hypercholesteremia |
| 7. H40.043 | Steroid Responder |
| 8. Z96.1 | Presence of Intraocular lens |

14

Case 1: POAG, Severe, w/RT Brain CVA

MANAGEMENT CONSIDERATIONS:

1. IOP elevated after starting chronic nasal steroid treatment
 - **Steroid Responder?**
2. Patient on “Max Generic Meds” and had SLT 6mo ago
 - **are generic IOP meds less effective than brand IOP meds?**
3. Patient is cardiovascularly challenged
 - **stopping Eliquis for surgery could lead to additional CVA**
4. Patient DOES NOT want glaucoma surgery
 - **are non-surgical options still available???**

WHAT SHOULD WE DO FOR THIS PATIENT???

15

Case 1: POAG, Severe, w/RT Brain CVA

TREATMENT PLAN & 1 MONTH FOLLOW UP EVALUATION RESULTS:

1. STOP NASAL STEROID, START NASAL/ORAL ANTI-HISTAMINE
 - **GOOD ALLERGY CONTROL WITH NASAL/ORAL ANTI-HISTAMINE**
2. Switch **GENERIC** glaucoma meds to **BRAND** glaucoma meds s/p SLT OU
 - **IOP REDUCTION FROM 19 OD/18 OS BACK TO 10 OD/10 OS**
3. Patient is cardiovascularly challenged
 - **D/C OF ELIQUIS NOT NECESSARY**
4. Patient DOES NOT want glaucoma surgery
 - **GLAUCOMA SURGERY NOT INDICATED WITH IOP REDUCTION**

DID IT WORK?? HOW IS THE PATIENT NOW??

16

Case 1: POAG, Severe, w/RT Brain CVA

6 YEARS LATER: PATIENT MONITORED Q4MO

1. IOP HAS REMAINED <12mm OU X 6 YEARS

2. POAG SEVERE STABLE OU WITH MAX BRAND MEDS 6 YRS s/p SLT

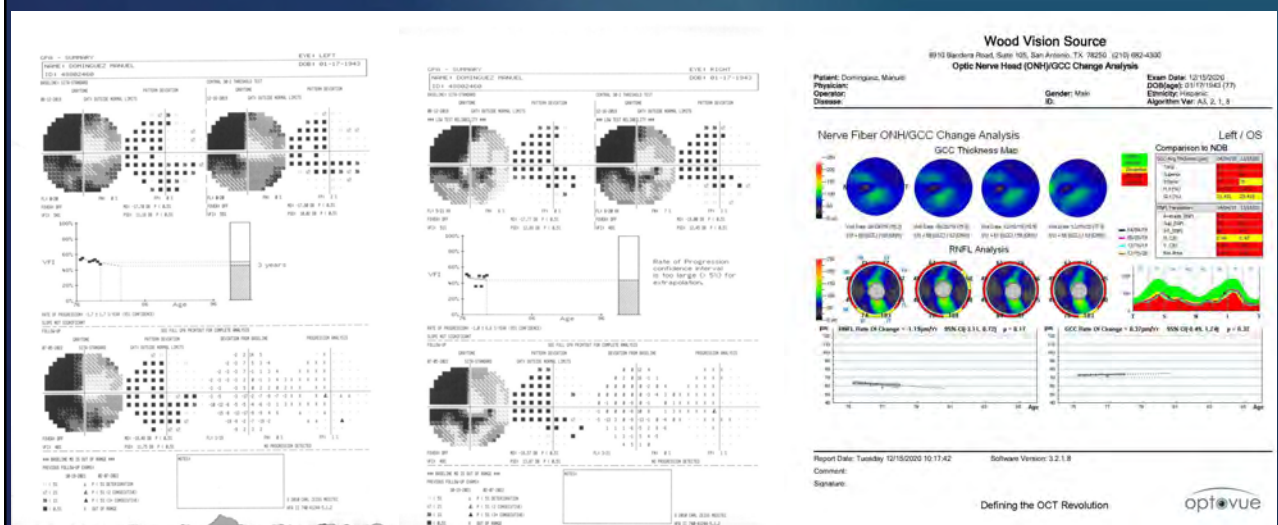
3. 82yo NOW, STILL CARDIOVASCULARLY CHALLENGED, LEFT HEMIANOPSIA STABLE

4. PATIENT GRATEFUL HE DID NOT REQUIRE GLAUCOMA SURGERY

17

Case 1: POAG, Severe, w/RT Brain CVA

6 YEARS LATER: PATIENT MONITORED Q4MO, STABLE, ALIVE AND HAPPY!



18

DIAGNOSTIC ADVANCES IN GLAUCOMA

INTRA-OCULAR PRESSURE/TONOMOMETRY:

Goldmann Tonometry (Gold Standard?)

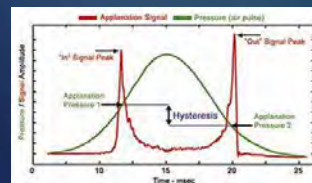
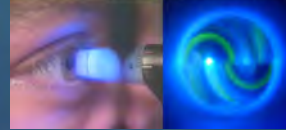
Non-Contact Tonometry (NCT)

Rebound Tonometry (iCare, Tono-Vera)

Ocular Response Analyzer (ORA) (*New Gold Standard?*)

- Corneal Hysteresis (CH)
- Corneal Compensated IOP (IOPcc)

Goldmann Applanation



19

DIAGNOSTIC ADVANCES IN GLAUCOMA

PACHYMETRY:

Ultrasound (gold standard)

Optical (OCT)

Novel (Pentacam, Orbscan, Pachycam)



OCULAR HYPERTENSIVE TREATMENT STUDY (OHTS 2002)

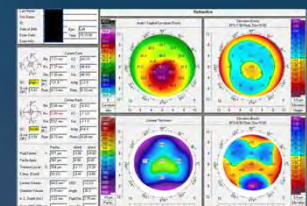
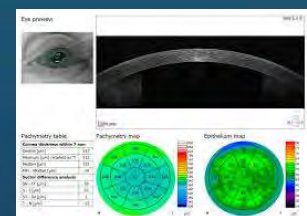
CCT 555microns to 588 microns (Risk for POAG not effected by CCT)

CCT <555 microns (Thin cornea)

- IOP higher than measured (unless IOPcc)
- Higher risk for glaucoma even with low IOP measurement

Corneal thickness >588 microns (Thick cornea)

- IOP lower than measured (unless IOPcc)
- Less risk for glaucoma even with IOP >20mmHg



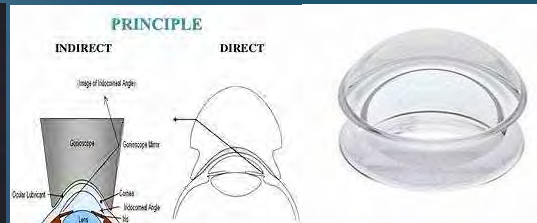
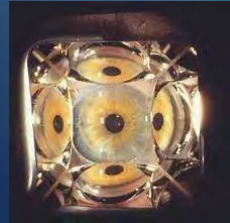
20

DIAGNOSTIC ADVANCES IN GLAUCOMA

ANTERIOR ANGLE ASSESSMENT:

INDIRECT GONIOSCOPY:

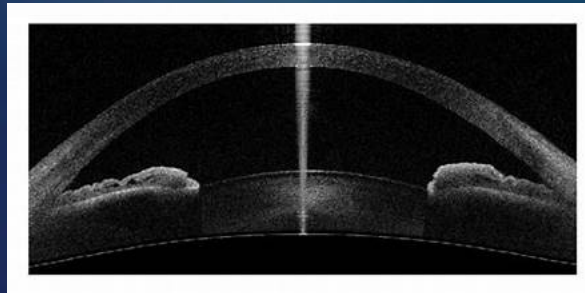
- Single mirror lens
- 3 mirror lens
- 4 mirror lens



DIRECT GONIOSCOPY:

- Koepe

ANTERIOR OCT SCAN:

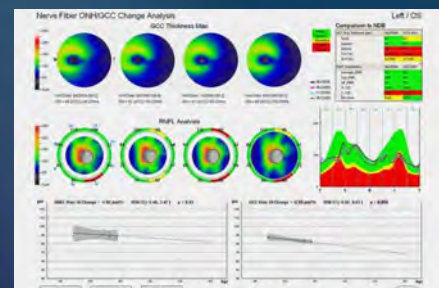
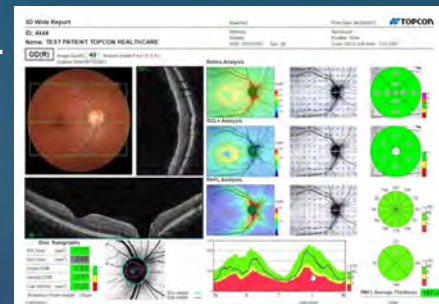
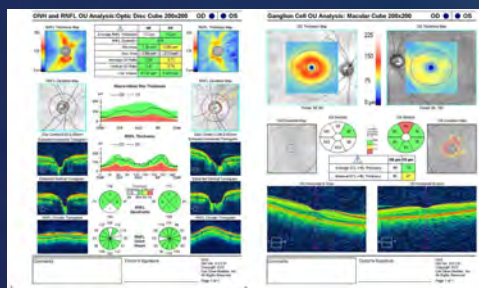


21

DIAGNOSTIC ADVANCES IN GLAUCOMA

OPTICAL COHERENCE TOMOGRAPHY (OCT):

- Nerve Fiber Layer Analysis (RNFL)
- Ganglion Cell Complex Analysis (GCC)
- Optic Nerve Cupping (C/D)
- Overall Disc Area (ODA)
- Anterior Angle Analysis
- Corneal Pachymetry



22

DIAGNOSTIC ADVANCES IN GLAUCOMA

TRADITIONAL VISUAL FIELD PERIMETRY:

Humphrey Visual Field Perimeter (Gold Standard)

Octopus Visual Field Perimeter

Optipol Visual Field Perimeter



23

DIAGNOSTIC ADVANCES IN GLAUCOMA

VIRTUAL REALITY PERIMETRY (VRP):

PICO Headset:

- White Stimulus on Black Background
- Mesopic testing (Rods and Cones)
- Virtual Vision, Olleyes many others

RadiusXR/Topcon Inspire Headset:

- White Stimulus on White Background
- Photopic testing, more similar to HVF

Virtual Reality Table Top Perimeter

- Topcon Tempo
- Binocular, white-on-white testing
- Photopic testing, more similar to HVF



24

DIAGNOSTIC ADVANCES IN GLAUCOMA

Traditional Perimetry vs VR Perimetry

PubMed
Advanced User Guide

Validation of a Wearable Virtual Reality Perimeter for Glaucoma Staging, The NOVA Trial: Novel Virtual Reality Field Assessment
Chris Bradley et al. Transl Vis Sci Technol. 2024.

Show details

Full text links Cite

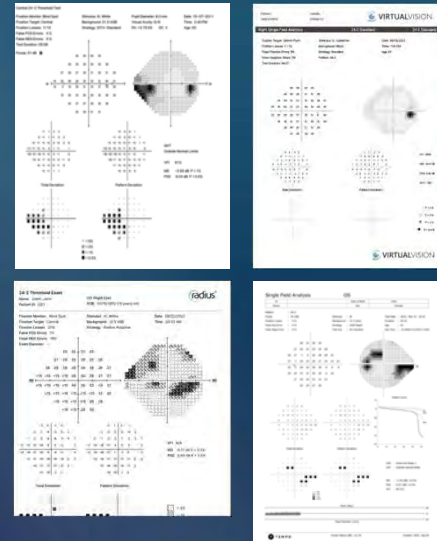
Abstract

Purpose: Compare estimated sensitivities of SITA-Standard to the RATA-Standard algorithm of the Radius virtual reality perimeter (VRP), and measure concordance in glaucoma staging.

Results: A total of 62 OD and 38 OS eyes were tested. Estimated sensitivities for SITA-Standard and RATA-Standard were not significantly different for OD, but were for OS-likely because of SITA-Standard OD and OS being significantly different in our sample, but not for RATA-Standard. Low agreement was observed between 15 to 22 dB. Concordance in glaucoma staging was high for both graders: kappa = 0.91 and kappa = 0.93. Average test duration was 298 seconds for RATA-Standard and 341 seconds for SITA-Standard. The correlation in mean deviation was 0.94.

Conclusions: Estimated sensitivities of RATA-Standard are comparable to SITA-Standard between 23 to 40 dB with high concordance in glaucoma staging.

Translational relevance: Radius VRP is statistically noninferior to HFA when staging glaucoma using Medicare definitions.



25

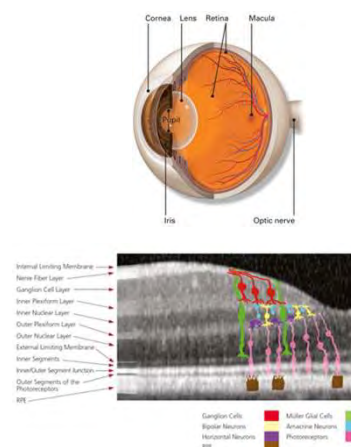
DIAGNOSTIC ADVANCES IN GLAUCOMA

PHOTOPIC NEGATIVE RESPONSE ELECTRORETINOGRAM (PhNR ERG)

WHAT IS PhNR ERG?



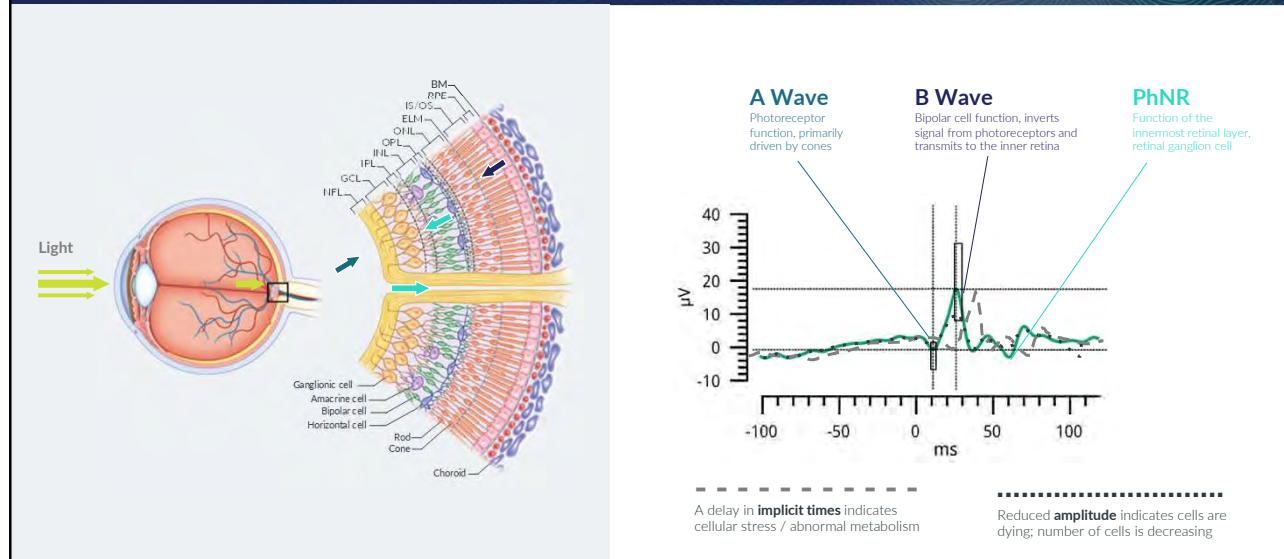
ERG measures the electrical responses of various cell types in the retina, including the **photoreceptors** (rods and cones), **inner retinal cells** (bipolar and amacrine cells), and the **ganglion cells** in response to a stimulus.



26

WHAT IS ERG?

The ERG waveform



27

GLAUCOMA

Ganglion cell health

Measuring ganglion cell health provides additional data in the management of a difficult disease

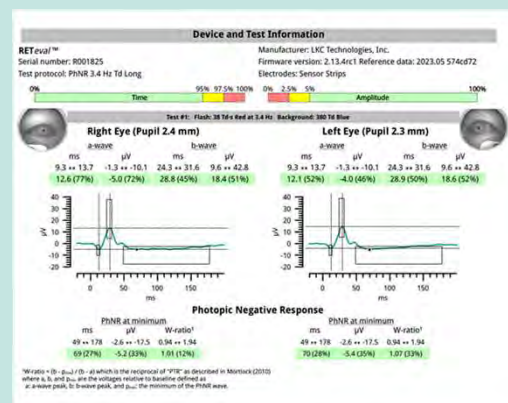
IMPLICIT TIME: Detects cellular stress

Slow time is more indicative of current cellular stress

AMPLITUDE: Detects cell damage

Small amplitude number indicates current cell death/damage

Goal of glaucoma management is to prevent cell damage!



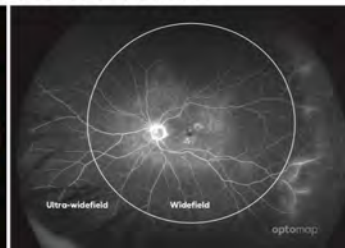
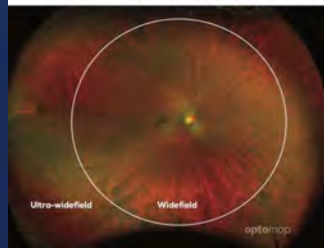
28

GLAUCOMA

Common ICD-10 codes that may warrant functional investigation**PhNR Protocol: Ganglion Cell Function**

- Disorder optic nerve & visual pathway: H47.011-H47.393
- Unspecified optic atrophy: H47.20
- Primary optic atrophy: H47.211
- Glaucomatous optic atrophy: H47.231-233
- Other disorders optic disc: H47.391-393
- RNFL bundle defect: H35.89

29

DIAGNOSTIC ADVANCES IN GLAUCOMA**FUNDUS PHOTOGRAPHY:****Standard Fundus Photo (30-50 degrees)****Widefield Fundus Photo (50-100 Degrees) (POSTERIOR TO VORTEX VEINS)****Ultra-Widefield Fundus Photo (100-200 degrees) (ANTERIOR TO VV)****Stereoscopic view****Red Free Filter (RNFL drop out)****Auto-fluorescent (AF)****DEFINING
ULTRA-WIDEFIELD**

30

DIAGNOSTIC ADVANCES IN GLAUCOMA

DIAGNOSIS STAGING FOR PRIMARY OPEN ANGLE GLAUCOMA

H40.1131 MILD POAG

- optic nerve abnormalities consistent with glaucoma, and retinal nerve fiber layer changes, but NO VISUAL FIELD ABNORMALITIES (excluding SWAP or FTD visual field testing.)

H40.1132 MODERATE POAG

- optic nerve abnormalities consistent with glaucoma and retinal nerve fiber layer changes, PLUS VISUAL FIELD ABNORMALITIES IN ONE (1) HEMIFIELD, BUT NOT WITHIN 5 DEGREES OF FIXATION

H40.1133 SEVERE POAG

- consistent with glaucoma, RNFL changes, glaucomatous visual field abnormalities IN BOTH HEMIFIELDS and/or VISION LOSS WITHIN 5 DEGREES OF FIXATION OF VISION IN AT LEAST ONE (1) HEMIFIELD.

31

DIAGNOSTIC ADVANCES IN GLAUCOMA

POAG Treatments: Topical

Prostaglandin Analogs (travoprost, bimatoprost, latanoprost, tafluprost)

Beta-Blockers (timolol, betaxolol)

Alpha-Agonists (brimonidine, apraclonidine)

Carbonic Anhydrase Inhibitors (brinzolamide, dorzolamide)

Rho Kinase Inhibitors (Rhopressa)

Combination Treatments (several)

Cholinergics/Miotics (Pilocarpine)

**CLINICAL PEARL:
RX PF DROPS WHEN MULTIDOSING
OR WITH DRY EYE WHEN POSSIBLE**

32

DIAGNOSTIC ADVANCES IN GLAUCOMA

POAG Treatments: Oral

Carbonic Anhydrase Inhibitors (methazolamide, acetazolamide)

POAG Treatments: Laser

Thermal:

- Argon Laser Trabeculoplasty

Non-Thermal:

- Selective Laser Trabeculoplasty (SLT)
- Transscleral (Direct) SLT
- Micropulse Laser Trabeculoplasty (MLT)

33

DIAGNOSTIC ADVANCES IN GLAUCOMA

POAG Treatments: Sustained-release Intra-Ocular Implants

Durysta (sustained-release bimatoprost)

iDoseTR (sustained-release travoprost)

POAG Treatments: MIGS (Minimally Invasive Glaucoma Surgery)

iStent/iStent Inject

XEN Gel Stent

Hydrus Microstent

Kahook Dual Blade (goniotomy)

34

. DIAGNOSTIC ADVANCES IN GLAUCOMA

POAG Treatments: Surgical

Tubes and Shunts (Ahmed, Baerveldt, Molteno)

Trabeculectomy

Cyclophotocoagulation (endoscopic, transscleral)

Canaloplasty

35

Case 2: Sjogren's syndrome
keratoconjunctivitis with
presentation of filamentary
keratitis and progression to
neurotrophic keratitis

36

Case 2: Sjogren's syndrome keratoconjunctivitis with presentation of filamentary keratitis and progression to neurotrophic keratitis

Chief Complaint: FP 70yo White Male presents with 10/10 acute severe pain left eye x 12 hours

37

Case 2: SS w/KConj with presentation of FK and progression to NK

HPI:

1. Sjogren's Syndrome with keratoconjunctivitis x 5 years OU
2. Hx of seasonal allergic conjunctivitis OU (Fall, Spring)
3. Early dementia, patient frequently forgets to take meds
4. Treated with 180 day extended duration punctal plugs LL OU

38

Case 2: SS w/KConj with presentation of FK and progression to NK

MEDICATIONS:

Optase Intense Dry Eye Artificial Tears: qid OU
 Optase Hylo Night Time Ointment: qhs OU
 Cyclosporine 0.05% eyedrops: bid OU
 OTC olopatadine 0.2% eyedrops: qday as needed
 Triglyceride based oral Omega 3 (2400mg/day po)
 Metformin (T2DM)

39

Case 2: SS w/KConj with presentation of FK and progression to NK

ROS:

Sjogren's Syndrome with keratoconjunctivitis OU
 Seasonal Allergic Conjunctivitis
 T2DM
 Early dementia

40

Case 2: SS w/KConj with presentation of FK and progression to NK

Initial Exam Results:

BCVA 20/25 OD, 20/50 OS Distance, NIPH OS

Pupils/CT/Motilities/Confrontation Fields: Normal OU

IOP: 18 mmHg OU (Tono-Vera)

Biomicroscopy OD: 1+ inferior PEK w/Nafl stain, 1+ bulbar conjunctival staining with Lissamine Green, 1+ bulbar chemosis/injection, 1+ UL superior papillary reaction, Clear PC IOL, PP in place LL

Biomicroscopy OS: 3+ diffuse PEK w/Nafl stain, 3 x corneal mucous filaments central/inferior cornea, 2+ bulbar conjunctival staining with LG, 2+ bulbar conjunctival injection/chemosis, 3+ superior papillary reaction, mucous in inferior fornix

41

Case 2: SS w/KConj with presentation of FK and progression to NK

DIAGNOSIS:

1. M35.01 Sjogren Syndrome with keratoconjunctivitis
2. H16.122 Filamentary keratitis, left eye
3. H10.45 Other, chronic allergic conjunctivitis
4. E11.9 Type 2 DM without retinopathy or DME

42

Case 2: SS w/KConj with presentation of FK and progression to NK

TREATMENT PLAN:

1. Remove filaments at slit lamp under topical anesthetic
 2. Apply cryopreserved amniotic membrane OS
 3. Begin OTC hypochlorous solution 100pm qid OS
 4. Continue current topical meds same OD only
- RTC 1 week follow up and removal of membrane ring OS

43

Case 2: SS w/KConj with presentation of FK and progression to NK

NEXT DAY!! Unscheduled follow up

CC: Left eye feels worse than yesterday, 11/10 FB sensation, requests to remove amniotic membrane
HPI: Taking all topical meds as instructed

BIOMICROSCOPY OD: same as day before

BIOMICROSCOPY OS: Cryopreserved amniotic membrane in place, no filaments or other FB found, other findings same as day before

44

Case 2: SS w/KConj with presentation of FK and progression to NK

TREATMENT PLAN:

1. Remove cryopreserved amniotic graft
 2. Replace with dehydrated amniotic graft with bandage soft contact lens (BSCL) under topical anesthetic
 3. Continue OTC hypochlorous solution 100pm qid OS
 4. Continue current topical meds same OD only
- RTC 1 week follow up and removal of BSCL OS**

45

Case 2: SS w/KConj with presentation of FK and progression to NK

1 Week Filamentary keratitis OS follow up:

CC: Left eye feels great, no FB sensation, vision back to normal, pain 0/10 OS

HPI: Taking all topical meds as instructed

BIOMICROSCOPY OD: same as day before

BIOMICROSCOPY OS: BSCL in place, amniotic graft absent (resorbed). After removal of BSCL, (-) PEK or filaments with Nafl stain, bulbar and palpebral inflammation 1+

46

Case 2: SS w/KConj with presentation of FK and progression to NK

TREATMENT PLAN:

1. Optase Intense Dry Eye Artificial Tears: qid OU
2. Optase Hylo Night Time Ointment: qhs OU
3. Cyclosporine 0.05% eyedrops: bid OU
4. OTC olopatadine 0.2% eyedrops: qday OU

RTC 3 months SSwKC follow up

47

Case 2: SS w/KConj with presentation of FK and progression to NK

1 MONTH LATER: Unscheduled follow up

CC: Left eye feels bad again, same as before, 10/10 FB sensation

HPI: Taking all topical meds as instructed

BIOMICROSCOPY OD: same as last exam

BIOMICROSCOPY OS: 4+ diffuse PEK, 5x corneal mucous filaments central/inferior cornea, Clear PC IOL, PP in place LL, 3+ bulbar injection/chemosis, 3+ superior papillary reaction, mucous in inferior fornix

48

Case 2: SS w/KConj with presentation of FK and progression to NK

TREATMENT PLAN:

1. Remove filaments at slit lamp under topical anesthetic
2. Apply CAM360 membrane w/Collagen Shield OS
3. Begin OTC hypochlorous solution 100pm qid OS
4. Continue current topical meds same OD only

RTC 1 week follow up

49

Case 2: SS w/KConj with presentation of FK and progression to NK

1 Week Filamentary keratitis OS follow up:

CC: Left eye feels great, no FB sensation, vision back to normal, pain 0/10 OS

HPI: Taking all topical meds as instructed

BIOMICROSCOPY OD: same as day before

BIOMICROSCOPY OS: CAM360 membrane/Collagen shield absent (resorbed). (-) PEK or filaments with Nafl stain, bulbar and palpebral inflammation 1+

50

Case 2: SS w/KConj with presentation of FK and progression to NK

TREATMENT PLAN:

1. Optase Intense Dry Eye Artificial Tears: qid OU
2. Optase Hylo Night Time Ointment: qhs OU
3. Cyclosporine 0.5% eyedrops: bid OU
4. OTC olopatadine 0.2% eyedrops: qday OU
5. Begin Hypochlorous eyedrops 100ppm bid OS

RTC 3 months SSwKC follow up

51

Case 2: SS w/KConj with presentation of FK and progression to NK

6 WEEKS LATER: Unscheduled follow up

CC: Pain in both eyes, OD 5/10, OS 10/10, feels similar to prior FK episodes but now OD also in mild pain.

HPI: Patient reports taking all topical meds as instructed

****Wife reports patient is getting more forgetful (dementia) and is not taking his eyedrops consistently**

BIOMICROSCOPY OD: 2+ inferior PEK, 1 corneal filament

BIOMICROSCOPY OS: 3+ diffuse PEK, 3 corneal filaments

Clear PC IOL OU, **punctal plugs missing LL OU**, 2+ injection/chemosis OU, mild mucous in inferior fornix OU

52

Case 2: SS w/KConj with presentation of FK and progression to NK

DIAGNOSIS:

1. M35.01 Sjogren Syndrome with keratoconjunctivitis
 - punctal plugs missing LL OU
2. H16.123 Filamentary keratitis, **both eyes**
3. H10.45 Other, chronic allergic conjunctivitis
4. E11.9 Type 2 DM without retinopathy or DME

53

Case 2: SS w/KConj with presentation of FK and progression to NK

TREATMENT PLAN:

1. Remove filaments at SL OU under topical anesthetic
2. Apply CAM360 membrane w/Collagen Shield OS
3. Apply BSCL only OD
4. Begin OTC hypochlorous solution 100pm qid OU
4. Stop all other topical treatments until follow up

RTC 1 week follow up:

Orders: Replace punctal plugs LL OU, remove BSCL OD

54

Case 2: SS w/KConj with presentation of FK and progression to NK

1 Week FK f/u, remove BSCL OU, replace PP OU:

CC: Both eyes feel great, no FB sensation, vision back to normal, pain 0/10 OU

HPI: Taking hypochlorous eyedrops as instructed (wife confirmed)

BIOMICROSCOPY OU: BSCL in place, CAM graft/CS absent OS (resorbed). After removal of BSCL, **1+ central PEK present OU** w/Nafl stain, patient reported mild "sandy" sensation OD only
CORNEAL SENSITIVITY TEST: **OD 1/3 Moderate, OS 0/3 Severe**

55

Case 2: SS w/KConj with presentation of FK and progression to NK

DIAGNOSIS:

1. M35.01 Sjogren Syndrome with keratoconjunctivitis
2. H16.123 Filamentary keratitis, both eyes
3. **H16.233 possible Neurotrophic keratitis OS > OD**
3. H10.45 Other, chronic allergic conjunctivitis
4. E11.9 Type 2 DM without retinopathy or DME

56

Case 2: SS w/KConj with presentation of FK and progression to NK

TREATMENT PLAN:

1. Optase Intense Dry Eye Artificial Tears: qid OU
2. Optase Hylo Night Time Ointment: qhs OU
3. Switch cyclosporine 0.05% to Vevye 0.1% bid OU
4. Stop Hypochlorous eyedrops.
5. Insert 0.4mm 180 day extended duration punctal plugs LL OU

RTC 1 months SSwKC/FK/possible Neurotrophic keratitis follow up

57

Case 2: SS w/KConj with presentation of FK and progression to NK

1 Month f/u, SSwKC OU, FK OU, possible NK OU:

CC: Both eyes feel great, no FB sensation, vision slightly blurred, pain 0/10 OU

HPI: Taking all drops including new VEVYE eyedrops

(wife confirmed he was)

BCVA: 20/25 OD, 20/30 OS, NIPH OU

BIOMICROSCOPY OU: 1+ central PEK OD, 2+ diffuse PEK OS w/NafI stain,

CORNEAL SENSITIVITY TEST: **OD 1/3 Moderate, OS 0/3 Severe**

58

Case 2: SS w/KConj with presentation of FK and progression to NK

DIAGNOSIS:

1. M35.01 Sjogren Syndrome with keratoconjunctivitis
2. H16.123 Filamentary keratitis, both eyes
3. **H16.233 Neurotrophic keratitis OS > OD**
3. H10.45 Other, chronic allergic conjunctivitis
4. E11.9 Type 2 DM without retinopathy or DME

59

Case 2: SS w/KConj with presentation of FK and progression to NK

TREATMENT PLAN:

1. Optase Intense Dry Eye Artificial Tears: qid OU
2. Optase Hylo Night Time Ointment: qhs OU
3. Continue Vevye 1.0% bid OU
4. Rx for Oxervate q2h OU (6x per day) x 8 wks

RTC 2 months SSwKC/FK/Neurotrophic keratitis follow up

60

Case 2: SS w/KConj with presentation of FK and progression to NK

2 Month f/u, SSwKC OU, FK OU, NK OU:

CC: Both eyes feel fine, no FB sensation, vision slightly better, pain 0/10 OU

HPI: Taking all drops including new Oxervate x 4 weeks and VEVYE eyedrops (wife confirmed he was)

BCVA: 20/25 OD, 20/25 OS, NIPH OU

BIOMICROSCOPY OU: 1+ central PEK OU w/Nafl stain

CORNEAL SENSITIVITY TEST: **OD 2/3 Mild, OS: 1/3 Moderate**

61

Case 2: SS w/KConj with presentation of FK and progression to NK

DIAGNOSIS:

1. M35.01 Sjogren Syndrome with keratoconjunctivitis
2. H16.123 Filamentary keratitis, both eyes
3. H16.233 Neurotrophic keratitis OS > OD

Ocular health is improving for all Dx

62

Case 2: SS w/KConj with presentation of FK and progression to NK

TREATMENT PLAN:

1. Optase Intense Dry Eye Artificial Tears: qid OU
2. Optase Hylo Night Time Ointment: qhs OU
3. Continue Vevye 1.0% bid OU
4. Rx for Oxervate q2h OU (6x per day) x 4 more wks

RTC 1 month SSwKC/FK/Neurotrophic keratitis follow up

63

Case 2: SS w/KConj with presentation of FK and progression to NK

1 Month f/u, SSwKC OU, FK OU, NK OU:

CC: Both eyes feel a little dry, occasional FB sensation, vision slightly improved, pain 1/10 OU

HPI: Taking all drops including Oxervate and Vevye eyedrops (wife confirmed he was)

BCVA: 20/25 OD, 20/25 OS, NIPH OU

BIOMICROSCOPY OU: Trace inferior PEK OU w/NafI stain, 1+ conjunctival stain with LG OU, 1+ injection/chemosis/papillae OU

CORNEAL SENSITIVITY TEST: **OD 2/3 Mild, OS 2/3 Mild**

***(reports more irritating than prior tests)**

64

Case 2: SS w/KConj with presentation of FK and progression to NK

DIAGNOSIS:

1. M35.01 Sjogren Syndrome with KC improved OU
2. H16.123 Filamentary keratitis, resolved OU
3. H16.233 Neurotrophic keratitis improved OU

65

Case 2: SS w/KConj with presentation of FK and progression to NK

TREATMENT PLAN:

1. Optase Intense Dry Eye Artificial Tears: qid OU
2. Optase Hylo Night Time Ointment: qhs OU
3. Continue Vevye 1.0% bid OU
4. Stop Oxervate (treatment complete)

RTC 2 months SSwKC/FK/Neurotrophic keratitis follow up

1 year s/p Oxervate Treatment: No recurrent FK or NK.

66

Case 2: SS w/KConj and FK w/progression to NK

Sjogren's Syndrome Dry Eye (SSDE)

Primary (singular diagnosis)

Secondary (associated with other auto-immune conditions)

- Rheumatoid arthritis (RA)
- System Lupus erythematosus (SLE)
- Raynaud disease
- Scleroderma
- Primary biliary cholangitis
- Autoimmune hepatitis

67

Case 2: SS w/KConj and FK w/progression to NK

SSDE Ocular manifestations

Blurry vision

Foreign Body sensation

Burning sensation

Photophobia

Red Eyes

68

Case 2: SS w/KConj and FK w/progression to NK

SSDE Ocular Findings MILD/MODERATE

Decreased meniscal height
 Decreased Tear Break Up Time (TBUT)
 Conjunctival hyperemia
 Conjunctival staining
 Corneal punctate epithelial erosions (PEK)

69

Case 2: SS w/KConj and FK w/progression to NK

SSDE Ocular Findings ADVANCED

Mucous discharge
 Filamentary keratitis
 Mucous Plaques
 Keratinization of corneal and conjunctiva
 Corneal calcification
 Meibomian Gland Dysfunction (MGD) (Lid Wiper Epitheliopathy)

70

Case 2: SS w/KConj and FK w/progression to NK

SSDE Ocular Findings SEVERE

Neurotrophic keratitis

Corneal perforation

Scleritis

Uveitis

Optic neuropathy

Retinal vasculitis

71

. Case 2: SS w/KConj and FK w/progression to NK

Diagnostic Advances in Dry Eye/Sjogren's Syndrome

Dry Eye Questionnaires

Standard Patient Evaluation of Eye Dryness (SPEED)

Ocular Surface Disease Index (OSDI-6) (**DEWS III**)

Ocular Surface Disease Index 6: OSDI 6
Dr. Hella Pult & Prof. Dr. Jochen Wulfschlag

Please answer the following questions by circling the numbers in the boxes.

	Constantly	Mostly	Often	Sometimes	Rarely
How often do you experience any of the following during a typical day of the last month?					
1. Eyes that are itchy or irritated?					
2. Burning eyes?					
How often do you experience any of the following during a typical day of the last month?					
3. Difficulty seeing?					
4. Watching TV (or similar)?					
How often do you experience any of the following during a typical day of the last month?					
5. Visual disturbance?					
6. Vision in eyes with low contrast?					

Sum of all questions: _____
Clearly Dry Eye if total sum is 6

Visual ← 6 → Dry Eye

SPEED™ QUESTIONNAIRE

Name: _____

Age: _____ Sex: _____

1. How often do you experience any of the following during a typical day of the last month?

	Constantly	Mostly	Often	Sometimes	Rarely
1. Eyes that are itchy or irritated?					
2. Burning eyes?					
3. Difficulty seeing?					
4. Watching TV (or similar)?					
5. Visual disturbance?					
6. Vision in eyes with low contrast?					

Sum of all questions: _____
Clearly Dry Eye if total sum is 6

Visual ← 6 → Dry Eye

72

Case 2: SS w/KConj and FK w/progression to NK

Diagnostic Advances in Dry Eye/Sjogren's Syndrome

Tear Production Tests

Schirmer's Test

Phenol Red Thread Test



Tear Film Stability Tests

Tear Break Up Time (TBUT)

Non-Invasive Tear Break Up Time (NIBUT)

Tear Meniscus Height (Slit lamp, OCT)



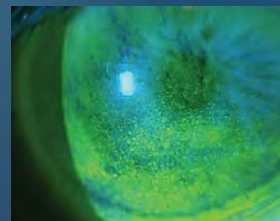
73

Case 2: SS w/KConj and FK w/progression to NK

Diagnostic Advances in Dry Eye/Sjogren's Syndrome

Ocular Surface Staining:

- Fluorescein Staining: Corneal Damage
- Lissamine Green: Conjunctival Damage
- Rose Bengal Staining: Conjunctival Damage



74

Case 2: SS w/KConj and FK w/progression to NK

Diagnostic Advances in Dry Eye/Sjogren's Syndrome

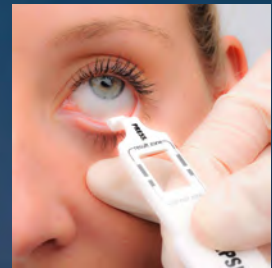
Osmolarity Testing

Scout Pro (B&L/Trukera/TearLab)



Inflammatory Biomarkers

InflammaDry (MMP-9)



75

Case 2: SS w/KConj and FK w/progression to NK

Diagnostic Advances in Dry Eye/Sjogren's Syndrome

Advanced Imaging Techniques

Tear Meniscus (OCT)

Meibography (Infrared imaging)

Lipid Layer Thickness (Interferometry)



76

Case 2: SS w/KConj and FK w/progression to NK

Diagnostic Advances in Dry Eye/Sjogren's Syndrome

Lab Work Up: Auto-antibody Testing:

Sjö Test

Anti-Ro/SSA and Anti-La/SSB

ANA (Antinuclear Antibody) Test

Rheumatoid Factor (RF)



77

. Case 2: SS w/KConj and FK w/progression to NK

Diagnostic Advances in Dry Eye/Sjogren's Syndrome

Modern Treatments Options for Dry Eye

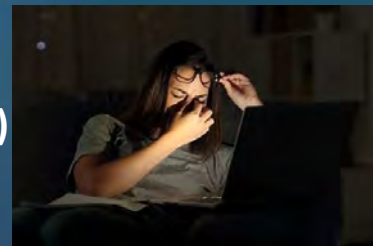
Tear Film and Ocular Surface Society (TFOS)

Report

DEWS I Report published 2007

DEWS II Report published 2017

DEW III Report published June 2, 2025



78

Case 2: SS w/KConj and FK w/progression to NK

Diagnostic Advances in Dry Eye/Sjogren's Syndrome

Modern Treatments Options for Dry Eye

Environmental Control

Optimal humidity levels at home

Eye goggles outdoors

Avoid air blowing into eyes from HVAC, wind, ceiling fan

Decrease screen time to due reduced blink rates

LAUGHTER (new in DEWS III report)



79

Case 2: SS w/KConj and FK w/progression to NK

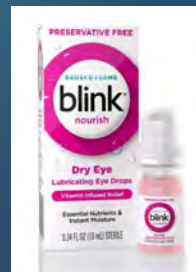
Diagnostic Advances in Dry Eye/Sjogren's Syndrome

Artificial Tears

Preservative Free drops

Preservative Free gels

Preservative Free ointments



80

Case 2: SS w/KConj and FK w/progression to NK

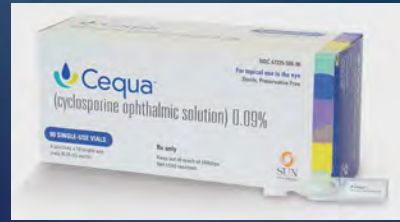
Diagnostic Advances in Dry Eye/Sjogren's Syndrome

Immunomodulatory Eye Drops (Chronic Therapy)

Lifitegrast (Xiidra)

Cyclosporine 0.05% Emulsion (Restasis/Restasis MultiDose)

Cyclosporine 0.09% Solution (Cequa)



81

Case 2: SS w/KConj and FK w/progression to NK

NEW TREATMENT OPTIONS:

Cyclosporine 0.1% Solution (Vevye)

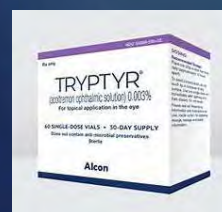
Perfluorobutylpentane (inactive), Contains No Water (no pH, no osmolarity), PF

Perfluorohexyloctane solution (Miebo)

Forms monolayer at air-liquid interface, reduces evaporation, Immiscible with water

Acoltremon 0.003% solution (Tryptyr)

- TRPM8 neuromodulator receptor agonist stimulating corneal nerves
- Phase 3 trials demonstrated rapid natural tear production Day 1



82

Case 2: SS w/KConj and FK w/progression to NK

Diagnostic Advances in Dry Eye/Sjogren's Syndrome

Steroid Eye Drops (Short Term Therapy)

Loteprednol suspension 0.25% (Eysuvis)

Shake well before use

Preserved with BAK

Dosing 2 weeks (IOP/Cataract)



Nasal Tear Stimulants

Varenicline nasal spray 0.03mg (Tyrvaya)

Stimulates tears through trigeminal parasympathetic pathway



83

Case 2: SS w/KConj and FK w/progression to NK

Diagnostic Advances in Dry Eye/Sjogren's Syndrome

Oral Dry Eye Treatments

Omega-3 Fatty Acids

Re-esterified Triglyceride Form (EPA/DHA)

Alcohol based Ethyl Ester Form (EPA/DHA)

Plant based (ALA) – must be converted by body to EPA/DHA

Blink NutriTears

Curcumin, Lutein/Zeaxanthin, Vitamin D

84

Case 2: SS w/KConj and FK w/progression to NK

Diagnostic Advances in Dry Eye/Sjogren's Syndrome

Oral Anti-biotics (MGD or high MMP-9)

Tetracycline

Doxycycline

Minocycline

Azithromycin (also available as topical AzaSite)

Oral Secretagogues

Cevimeline (Evoxac)

Pilocarpine (Salagen)



85

Case 2: SS w/KConj and FK w/progression to NK

Dry Eye Treatment Procedures

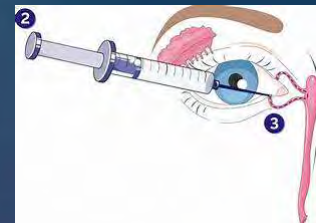
Punctal Occlusion

Temporary/Dissolving Punctal Plugs (Collagen)

Semi-Permanent Plugs (silicone, acrylic)

Permanent Punctal Occlusion (cautery)

Hyaluronic acid gel (Lacrifill Canalicular Gel)



86

Case 2: SS w/KConj and FK w/progression to NK

Light Therapy

Intense Pulsed Light (IPL)

Photobiomodulation (LLLT)

(FDA approved for ARMD, investigated for Glaucoma/Myopia Control)



Sound Therapy

Radiofrequency (RF, off-label)



87

Case 2: SS w/KConj and FK w/progression to NK

Thermal Pulsation

Lipiflow

TearCare

iLux

MiBo Thermoflo

Activa Med Non-Invasive Therapy



Thermo-Mechanical Action (TMA)

Tixel-i



88

. Case 2: SS w/KConj and FK w/progression to NK

Diagnostic Advances in Dry Eye/Sjogren's Syndrome

Foreign Body Removal

Filamentary keratitis



Contact Lens Treatments

Silicone Hydrogel Bandage SCL

Drug delivery CL

Scleral RGP contact lens



89

. Case 2: SS w/KConj and FK w/progression to NK

Diagnostic Advances in Dry Eye/Sjogren's Syndrome

Biological Treatments

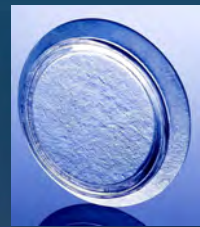
Amniotic membrane (human growth factor/placenta)

Cryopreserved (ProKera, CAM360)

Dehydrated (BioDOptix, AmbioDisk)

Autologous serum eyedrops

Platelet-rich plasma eyedrops (PRP eyedrops)



90

. Case 2: SS w/KConj and FK w/progression to NK

Diagnostic Advances in Dry Eye/Sjogren's Syndrome

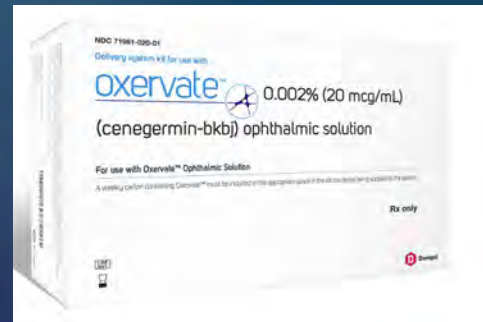
Oxervate (for neurotrophic keratitis)

Recombinant human nerve growth factor

1 drop 6 x daily @ 2 hour intervals x 8 weeks

Store in refrigeration

\$\$\$ Very Expensive



91

Case 3: Non-Arteritic Ischemic Optic Neuropathy with Bi-Temporal Hemianopsia due to Anterior Communicating Artery Aneurysm

92

Case 3: NA-ION w/Bi-Temporal Hemianopsia due to ACAA

Chief Complaint: EP 32yo White Female presents for 2nd opinion for complaint of intermittent diplopia (horizontal), blurred peripheral vision in the left eye and severe headaches that have occurred over the past 2 months.

HPI:

1. PCP referred patient to local OMD last week. Results normal per OMD. Patient states no visual testing or imaging ordered.
2. No history of migraine headaches prior to 2 months ago

93

Case 3: NA-ION w/Bi-Temporal Hemianopsia due to ACAA

Initial Exam Results:

BCVA 20/40 OD/OS/OU Distance, NIPH

Pupils: Normal OD, + **APD OS**

CT/Motilities: No strabismus, full motilities

Confrontation fields: Full OD, **temporal constriction OS**

IOP: 19 mmHg OU (iCare)

Biomicroscopy: Normal for age OU

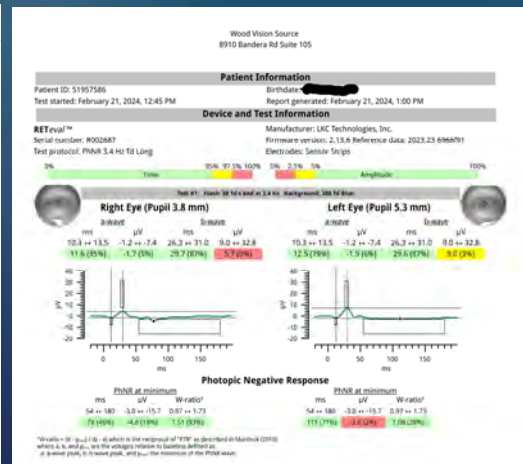
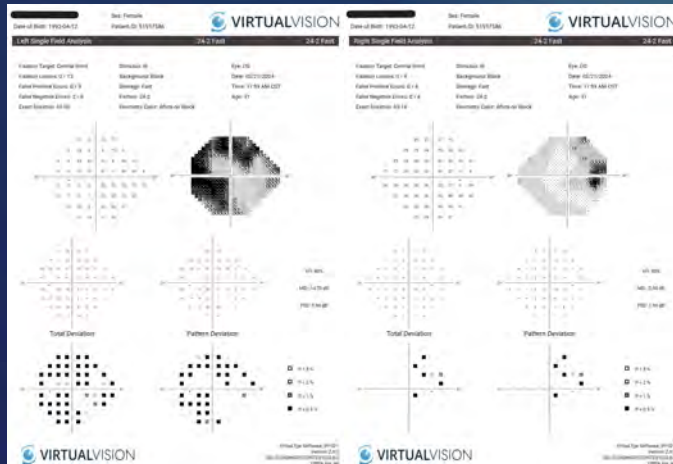
DFE: C/D 0.5/0.5, well perfused, no edema, no notching
C/D **0.75/0.70** OS, mild pallor, no edema, mild notch
Macula, peripheral retina normal OU

94

Case 3: NA-ION w/Bi-Temporal Hemianopsia due to ACAA

VISUAL FIELD: Bitemporal VF defects OS > OD

PhNR ERG: OD: Normal ERG/w-ratio: OS: Abnormal Amp/w-ratio



95

Case 3: NA-ION w/Bi-Temporal Hemianopsia due to ACAA

DIAGNOSIS:

1. H53.453 Other localized visual field defect, bilateral, suspicious for incongruous bi-temporal VF defect (optic chiasm, left side)
2. H47.292 Other optic atrophy, left eye

TREATMENT PLAN:

1. Orders to PCP: MRI of brain and orbits with and without contrast and MRA to rule out compressive lesion at optic chiasm likely left of midline.
 2. Consultation with Neurology to follow up on imaging findings and begin appropriate management.
 3. RTC 3 months for follow up neuro-ophthalmological testing
- Orders: (pupil testing then dilate, REteval PhNR erg, OCT NFL scan, 24-2 VF).

96

Case 3: NA-ION w/Bi-Temporal Hemianopsia due to ACAA

4 month neuro-ophthalmological follow up visual field defect OS > OD and optic atrophy OS feared to be due to optic chiasm lesion. follow up

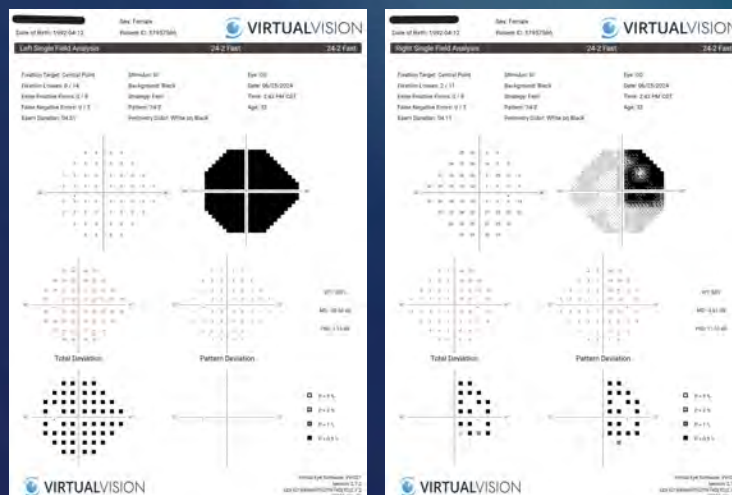
HPI:

1. MRI/MRA confirmed Anterior Communicating Artery Aneurysm
2. Patient had hemorrhage prior to surgical resection and now NLP left eye.
3. Patient is under the care of neurologist.
4. Returning today to confirm vision status s/p hemorrhage of ACAA at optic chiasm

97

Case 3: NA-ION w/Bi-Temporal Hemianopsia due to ACAA

VISUAL FIELD: OD: Superior temporal VF defect, worse
OS: NLP 100 VF loss after ruptured ACAA at optic chiasm



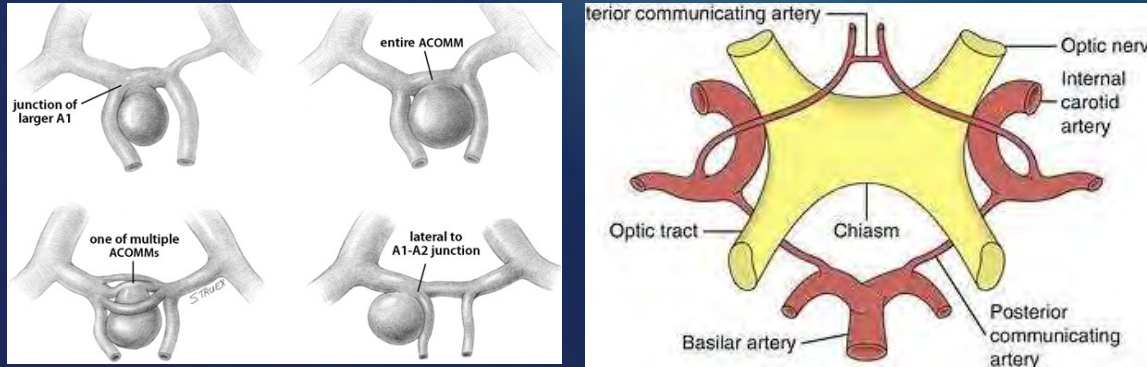
98

Case 3: NA-ION w/Bi-Temporal Hemianopsia due to ACAA

Anatomy: Anterior Communicating artery runs adjacent to anterior side of optic chiasm.

An aneurysm at midline will affect both the visual field equally.

An aneurysm Left or Right of midline will cause more visual field loss on the side more affected.



99

Case 3: NA-ION w/Bi-Temporal Hemianopsia due to ACAA

Common Symptoms:

Headaches

Visual disturbances/Blurred vision

Diplopia

Mental status change

100

Case 3: NA-ION w/Bi-Temporal Hemianopsia due to ACAA

Diagnostic Testing:

Visual Acuity: Blurred vision 1 or both eyes

Pupil responses: APD often present

Dilated fundus exam: Optic nerve pallor, cupping, notching, edema

24-2 or 30-2 Visual Field Testing: bitemporal hemianopsia.

Ocular Coherence Tomography

Retinal Nerve Fiber Layer (RNFL)

Ganglion Cell Complex (GCC)

Defects from optic atrophy/NA-ION often present

Electro-Retinogram Photopic Negative Response (PhNR erg)

Abnormal PhNR erg and/or W-ratio from NA-ION

101

Case 3: NA-ION w/Bi-Temporal Hemianopsia due to ACAA

Neuroimaging:

MRI with contrast: evaluate for tumor/pituitary adenoma location and size

CT scan or MRA: evaluate for aneurysm location and size.

Neurosurgical Treatment:

Surgical removal/clipping of aneurysm

Prognosis:

Good if removed prior to hemorrhage

Guarded if hemorrhage occurs

Follow-up Care

Repeat diagnostic testing at 3 & 9 months after neuro-surgical treatment, evaluate for vision/visual field improvement

102

Case 4: Treatment of Epidemic Keratoconjunctivitis with hypochlorous acid 100ppm eyedrop solution as an alternative to betadine 5% irrigating solution and topical steroids

103

Case 4: Treatment of Epidemic Keratoconjunctivitis with hypochlorous acid 100ppm eyedrop solution

Chief Complaint: FP 35yo White Male presents with red, watery eyes of 3 day onset.

HPI: Patient had been swimming 3 days ago. Woke up the next morning with sore throat, swollen glands, red/watery eyes OU.

104

Case 4: Treatment of Epidemic Keratoconjunctivitis with hypochlorous acid 100ppm eyedrop solution

Initial Exam Results:

BCVA 20/25 OD, 20/25 OS Distance

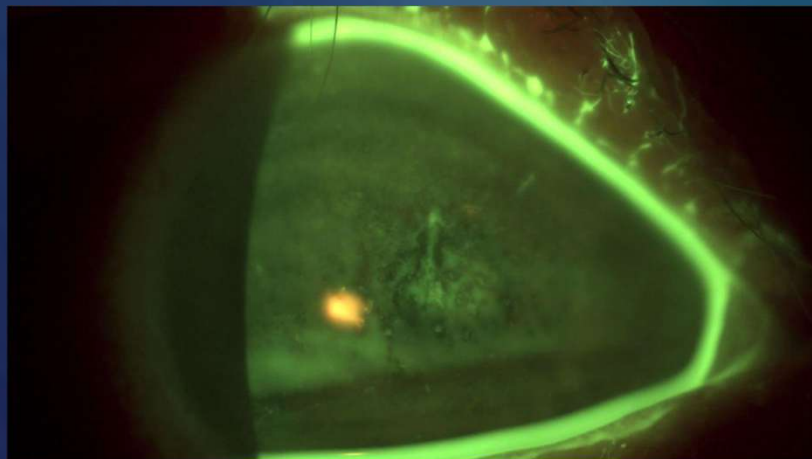
Pupils/CT/Motilities/Confrontation Fields: Normal OU

IOP: 18 mmHg OU (Tono-Vera)

Biomicroscopy OU: 3+ bulbar conjunctival chemosis/injection with small petechial hemorrhages, 2+ stringy mucous, 3+ epiphora, 2+ central PEK with Nafl stain, (-) SEI, + palpable and tender PA nodes Right and Left Sides

105

Case 4: Treatment of Epidemic Keratoconjunctivitis with hypochlorous acid 100ppm eyedrop solution



106

Case 4: Treatment of Epidemic Keratoconjunctivitis with hypochlorous acid 100ppm eyedrop solution

DIAGNOSIS:

1. B30.3 Acute Epidemic Hemorrhagic Conjunctivitis (Enteroviral) OU

TREATMENT PLAN:

1. Hypochlorous acid 100pm eyedrops q1h OU Day 1, then q2h OU Day 2 then qid OU x 1 week

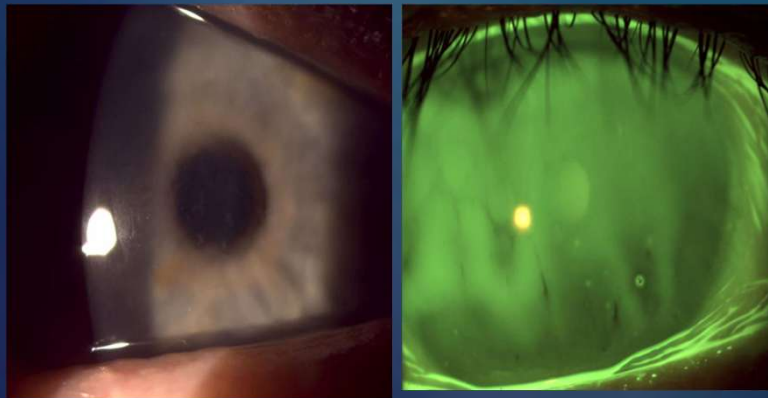
RTC 2 days EKC follow up

107

Case 4: Treatment of Epidemic Keratoconjunctivitis with hypochlorous acid 100ppm eyedrop solution

2 day EKC follow up:

CC: Eyes feel great, no watering, no burning, redness 90% improved



108

Case 4: Treatment of Epidemic Keratoconjunctivitis with hypochlorous acid 100ppm eyedrop solution

DIAGNOSIS:

1. B30.3 Acute Epidemic Hemorrhagic Conjunctivitis (Enteroviral) OU, improved

TREATMENT PLAN:

- 1. Continue Hypochlorous acid 100pm eyedrops qid OU x 5 days then stop**
- 2. Ok to return to work**

109

Case 4: Treatment of Epidemic Keratoconjunctivitis with hypochlorous acid 100ppm eyedrop solution

Epidemic KeratoConjunctivitis:

Etiology:

Highly contagious, viral conjunctivitis primarily caused by adenovirus particularly serotypes 8, 19 and 37

Epidemiology:

Highly contagious, potential for outbreaks in schools, daycares, workplace.

110

. Case 4: Treatment of Epidemic Keratoconjunctivitis with hypochlorous acid 100ppm eyedrop solution

Epidemic KeratoConjunctivitis:

Pathophysiology and Transmission

Transmission Routes: Direct contact

- Contaminated surfaces

- Eye care equipment

- Fomites (contaminated items, ie. clothes, utensils, towels)

111

Case 4: Treatment of Epidemic Keratoconjunctivitis with hypochlorous acid 100ppm eyedrop solution

Clinical Presentation of EKC

Symptoms:

- Eye redness

- Tearing/epiphora

- Photophobia

- Foreign body sensation

- Blurred vision.

112

Case 4: Treatment of Epidemic Keratoconjunctivitis with hypochlorous acid 100ppm eyedrop solution

Clinical Presentation of EKC

Signs:

- Follicular conjunctivitis
- Hemorrhagic conjunctivitis
- Conjunctival hyperemia
- Pseudo-membrane formation
- Punctate keratitis
- Corneal sub-epithelial infiltrates
- Can cause permanent glare/blur
- Palpable/tender pre-auricular node

113

Case 4: Treatment of Epidemic Keratoconjunctivitis with hypochlorous acid 100ppm eyedrop solution

Hypochlorous acid solution: (HOCl)

Common Preparations

Lid Prep Eyedrop/Spray: 100ppm (0.010%)

Hand Prep Spray: 150ppm (0.015%)

Surface Prep Spray: 200ppm (0.020%)

114

Case 4: Treatment of Epidemic Keratoconjunctivitis with hypochlorous acid 100ppm eyedrop solution

Hypochlorous acid solution: (HOCl)

Indications:

Disinfection

Antisepsis

Wound care

Mechanism of action

Oxidation, releases O₂ molecule when activated

115

Case 4: Treatment of Epidemic Keratoconjunctivitis with hypochlorous acid 100ppm eyedrop solution

Availability:

Found within white blood cells, Commercially produced OTC product

Safety:

ISO Ocular Testing

Non-cytotoxic, Zero irritancy

Dermal Testing

No toxicity, Improved skin health, Improved TCPO₂ (oxygen levels)

LD50

Lethal dose with ingestion = 70 gallons

116

Microorganism Efficacy Test of HOCL 0.01%

MICROORGANISM	TIME POINT	% REDUCTION	MICROORGANISM	TIME POINT	% REDUCTION
Acinetobacter baumannii	15 seconds	100%	E.Coli	60 seconds	>99.9999%
Enterococcus faecalis	15 seconds	100%	Pseudoonas aruginosa	60 seconds	>99.9999%
Listeria monocytogens	60 seconds	>99.96%	S.aureus	60 seconds	>99.9999%
Propionibacterium	60 seconds	>99.99%	A brasiliensis	60 seconds	>99.9999%
Candida albicans	60 seconds	>99.9999%	K. pneumonia (CRE)	60 seconds	>99.9994%
Proteus mirabilis	15 seconds	>99.9999%	C. Difficile	60 seconds	>99.9999%
Serratia marscesens	15 seconds	>99.9999%	Human Coronavirus	15 seconds	>99.82% *
Staphylococcus aureus (MRSA)	15 seconds	>99.9999%	Adenovirus 2	60 seconds	>99.99%

All Microorganisms were killed in the 15 second contact time. 15 seconds was the quickest time to put neutralizing agents on test cultures.

*This is the highest possible reduction due to laboratories inability to full grow the virus. Microchem Laboratory, Round Rock, TX on multiple dates.

117

THANK YOU!

Questions?

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118