YOUR PATIENT HAS GLAUCOMA… NOW WHAT?

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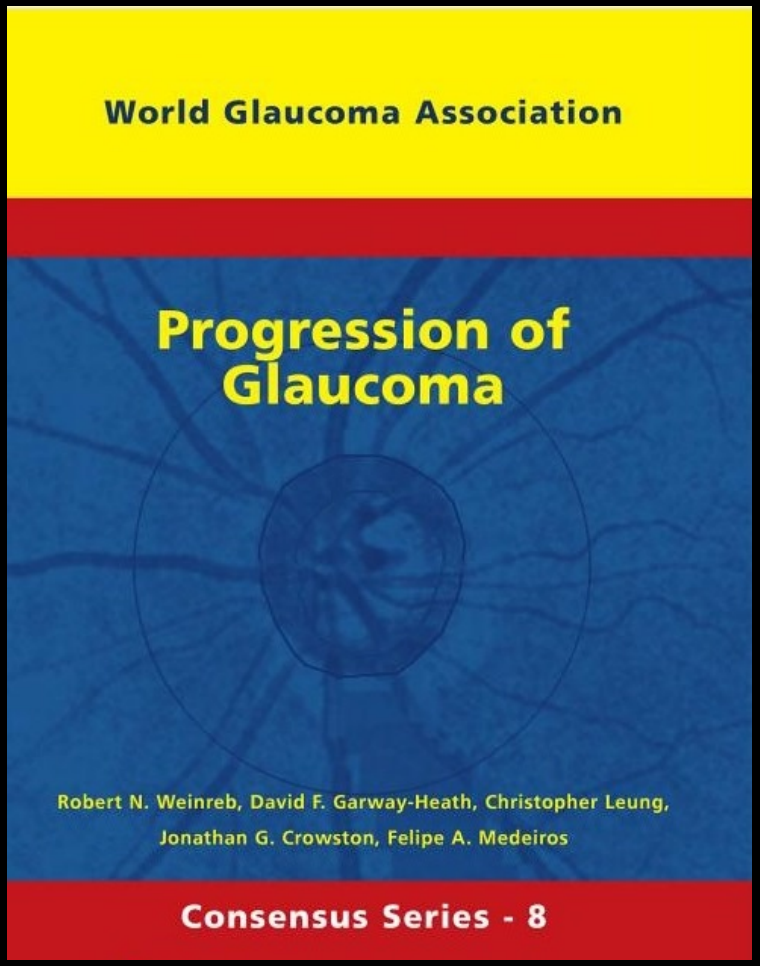
4. MONITOR FOR CHANGE

WGA CONSENSUS STATEMENTS

Progression of Glaucoma, World Glaucoma Association, 2011 Kugler Publications



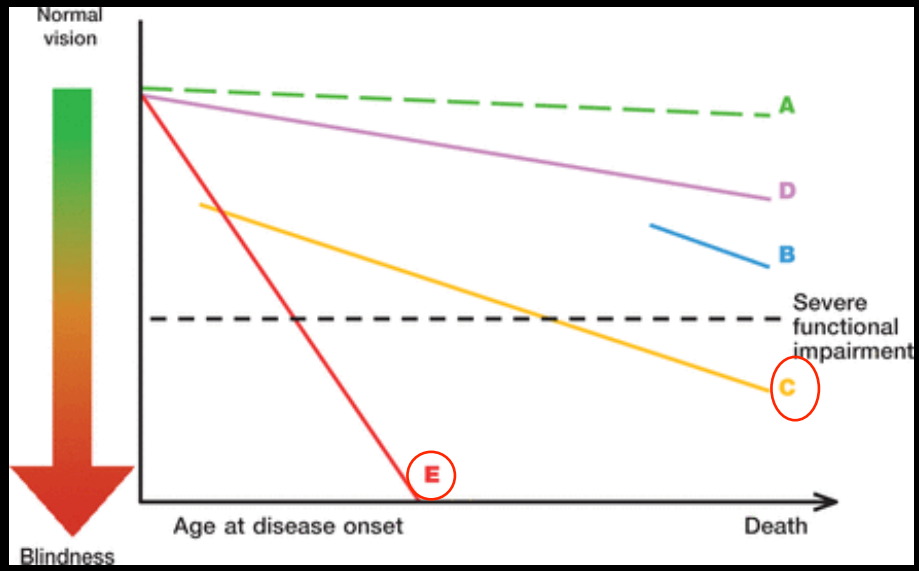
- ONCE THE DIAGNOSIS OF GLAUCOMA HAS BEEN MADE THE MOST IMPORTANT REMAINING QUESTION IS…
  - WHETHER THE DISEASE IS STABLE AND THE THERAPY / COMPLIANCE ARE SUFFICIENT

  OR
  - WHETHER THE DISEASE IS PROGRESSIVE AND THE THERAPY IN RELATION TO LIFE EXPECTANCY HAS TO BE INTENSIFIED

PROGRESSION

- 3 TYPES OF GLAUCOMA PATIENTS
  - SLOW/NORMAL PROGRESSORS
  - FAST PROGRESSORS
  - CATASTROPHIC PROGRESSORS

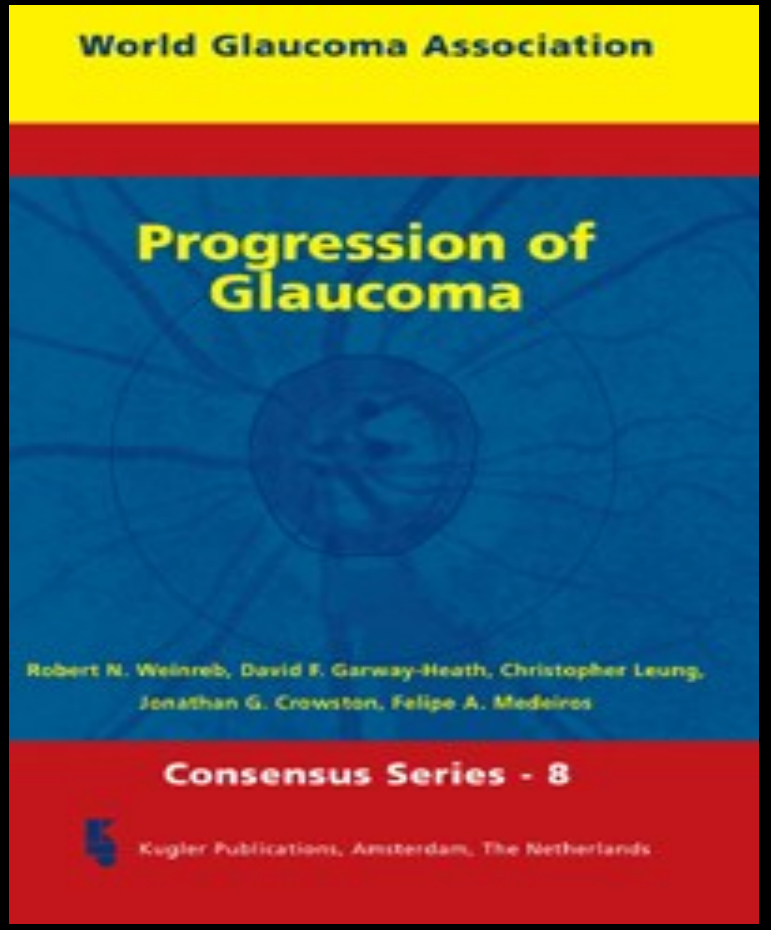
- A = NORMAL AGING
- D = YOUNG, SLOW RATE OF PROGRESSION
- B = OLD, MODERATE RATE OF PROGRESSION
- C = YOUNG, MODERATE RATE OF PROGRESSION
- E = YOUNG, RAPID PROGRESSION



European Glaucoma Society Terminology and Guidelines for Glaucoma, 4th Edition - Chapter 3: Treatment principles and options Supported by the EGS Foundation British Journal of Ophthalmology 2017;101:130-195

RISK FACTORS FOR PROGRESSION

- IOP
- THINNER CENTRAL CORNEAL THICKNESS
- PSEUDOEXFOLIATION
- DISC HEMMORHAGE
- OLDER AGE
- LOWER OCULAR PERFUSION PRESSURE

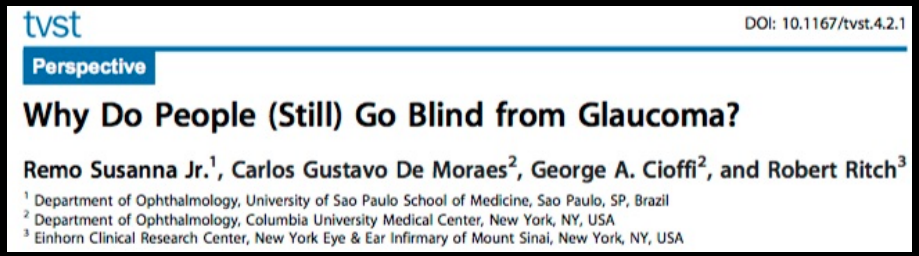


June 28, 2011

https://wga.one/wga/consensus-8/

WHY PATIENTS PROGRESS

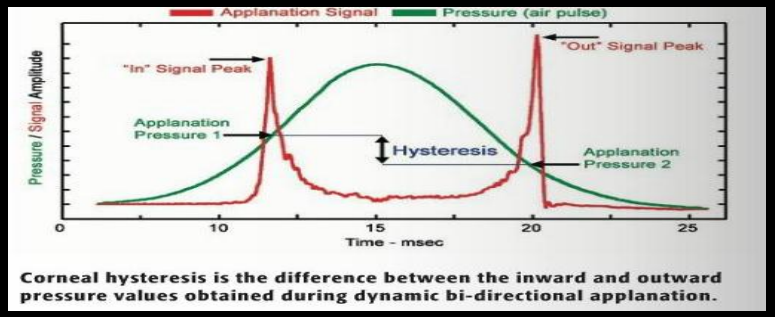
- GLAUCOMA
  - IS UNDERDIAGNOSED
  - IS UNDERTREATED
    - SEVERITY OF DAMAGE UNDERESTIMATED
    - INSUFFICIENT IOP REDUCTION
    - IOP PEAKS AND MEAN IOP NOT ADEQUATELY ASSESSED
    - DIFFICULTY EVALUATING RATE OF PROGRESSION
  - PATIENTS LACK OF COMPLIANCE



Susanna, Remo Jr et al. "Why Do People (Still) Go Blind from Glaucoma?." Translational vision science & technology vol. 4,2 1. 9 Mar. 2015, doi:10.1167/tvst.4.2.1

RISK FACTOR FOR PROGRESSION

- CORNEAL HYSTERESIS
  - THEORY
    - THOUGHT TO REPRESENT VISCOELASTICITY
    - CORNEAL DAMPENING CAPACITY
      - RESISTANCE TO DEFORMATION
      - ABILITY TO BUFFER FLUCTUATIONS IN IOP
      - ABILITHY TO ABSORB / DISSIPATE ENERGY
  - HOW IS IT MEASURED
    - OCULAR RESPONSE ANALYZER
    - AROUND SINCE 2008
    - MEASURES
      - BIOMECHANICAL PROPERTIES OF CORNEA
    - COMPANIES: REICHERT



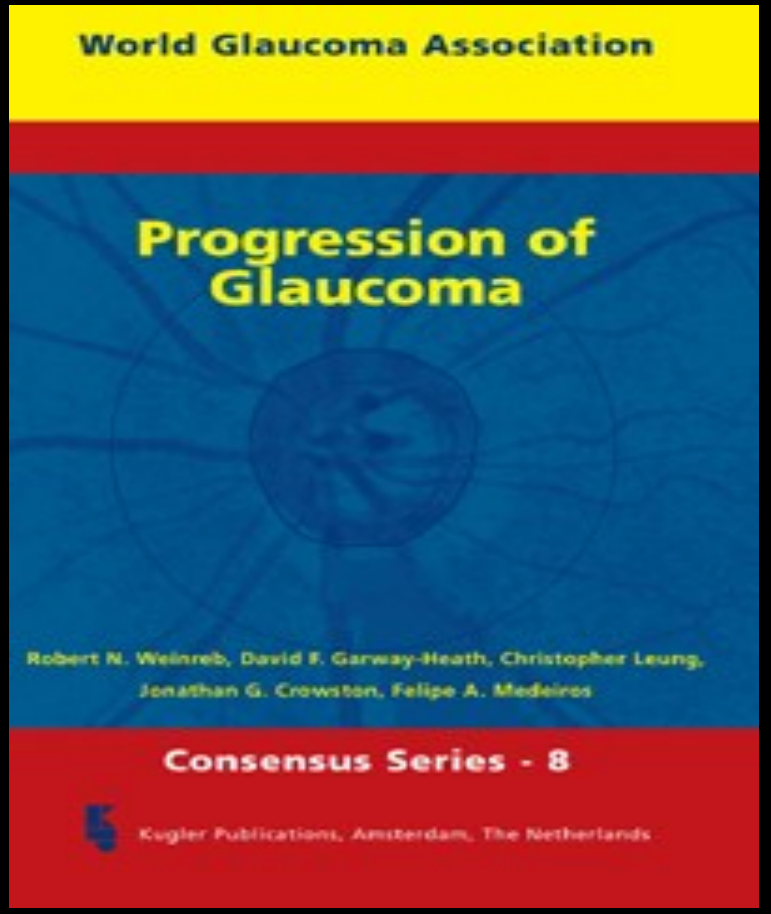
Corneal hysteresis is the difference between the inward and outward pressure values obtained during dynamic bi-directional applanation.

CORNEAL HYSTERESIS AND GLAUCOMA

- HIGHER CORNEAL HYSTERESIS (> 9)
  - MORE LIKELY TO CUSHION SHORT / LONGTERM IOP INCREASES = MORE PROTECTIVE
- LOWER CORNEAL HYSTERESIS (< 9)
  - LOWER CAPACITY TO DAMPEN IOP SPIKES AND/OR REDUCED ABILITY OF ONH STRUCTURES TO RESPOND TO IOP FLUCTUATIONS
  - INCREASED RISK FOR DEVELOPING GLAUCOMA
  - 2006, 2012 STUDIES
    - ASSOCIATED WITH PROGRESSIVE VF WORSENING
- CAN IT HELP IMPACT TREATMENT DECISIONS?
  - LESS CONCERNED IN A PATIENT WITH HIGH IOP AND HIGH CORNEAL HYSTERESIS
    - LESS LIKELY TO PROGRESS
  - MORE CONCERNED IN A PATIENT WITH LOW CORNEAL HYSTERESIS
    - MORE LIKELY TO HAVE RAPID PROGRESSION
    - BE MORE AGGRESSIVE IN TREATMENT, FOLLOW MORE FREQUENTLY

HOW TO MONITOR FOR PROGRESSON

- CURRENTLY, NO SPECIFIC TEST CAN BE REGARDED AS THE PERFECT REFERENCE STANDARD FOR DETECTION OF GLAUCOMA STRUCTURAL AND/OR FUNCTIONAL PROGRESSION
- BOTH STRUCTURE AND FUNCTION SHOULD BE EVALUATED FOR DETECTION OF GLAUCOMATOUS PROGRESSION



June 28, 2011

https://wga.one/wga/consensus-8/

WHAT TO MONITOR FOR PROGRESSION?

- STRUCTURE
  - OPTIC NERVE
  - OCT
    - RNFL
    - GCC
- FUNCTION
  - VISUAL FIED

WHAT CONSTITUES OPTIC NERVE CHANGE?

- OPTIC NERVE
  - INCREASED CUPPING
  - NEW DISC HEMORRHAGE
    - ASSOCIATED WITH
      - ONH / RNFL PROGRESSION
      - 24-2 AND CENTRAL 10-2 PROGRESSION
  - NEW NOTCHING
  - ENLARGEMENT OF PARAPAPILLARY ATROPHY
  - NEW OR EXPANSION OF CLINICALLY VISIBLE RNFL DEFECT

- HOW TO TELL?
  - TAKE PHOTOS
    - EVERY FEW YEARS, REVIEW THEM

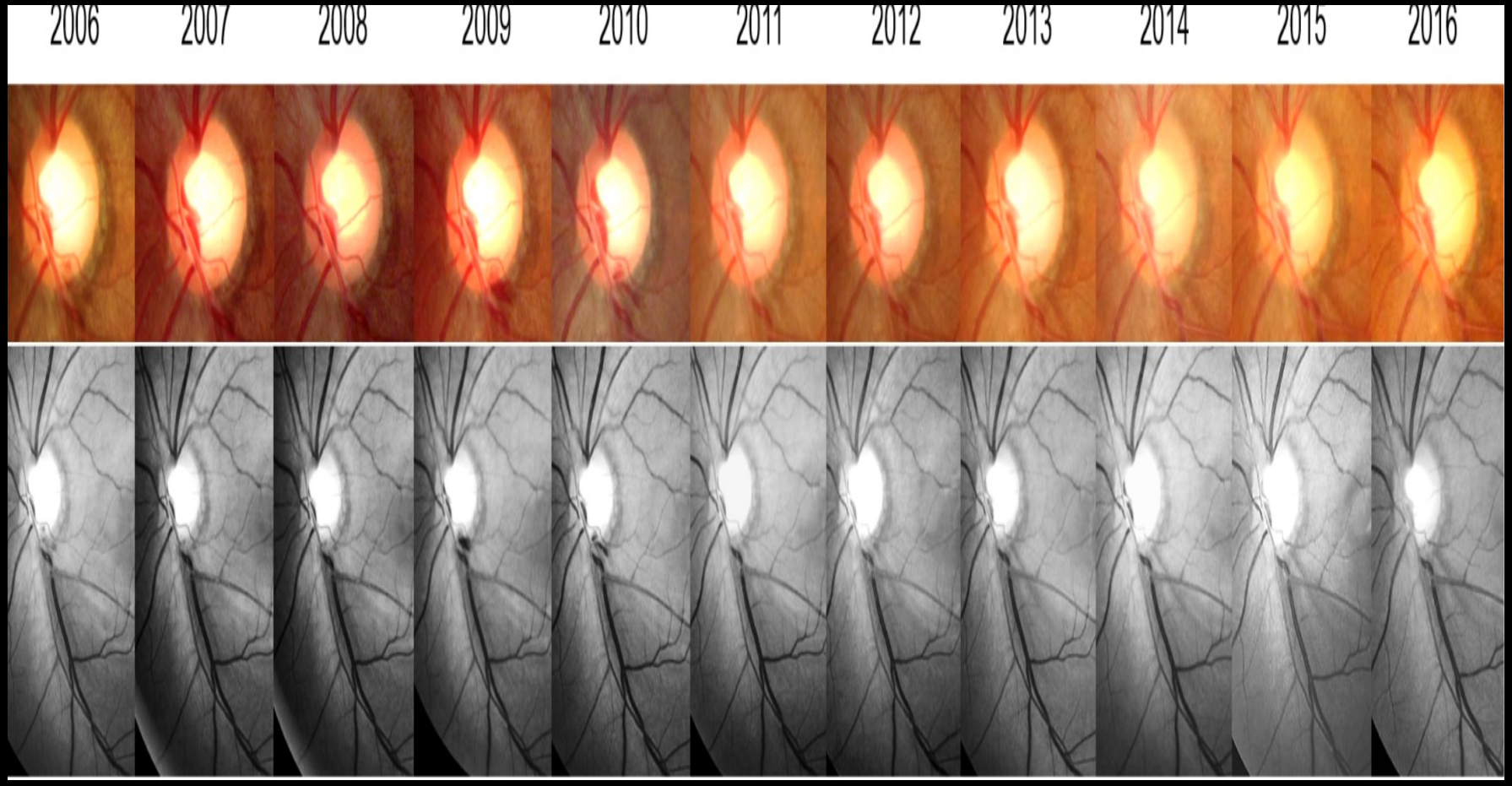
ONH CHANGE EXAMPLE

OD INCREASED CUPPING PPA, DISC HEME / NOTCH, NASALIZATION
OS INCREASED CUPPING / PPA

Sears, Nathan C et al. "Progressive optic disc cupping over 20 years in a patient with TBK1-associated glaucoma." Ophthalmology. Glaucoma vol. 3,2 (2020): 167-168.

ONH CHANGE EXAMPLE

INCREASED CUPPING, NEW DISC HEMES / RNFL LOSS EXPANSION



Ha, Ahnul et al. “Impact of optic disc hemorrhage on subsequent glaucoma progression in mild-to-moderate myopia.” PloS one vol. 12,12 e0189706. 18 Dec. 2017

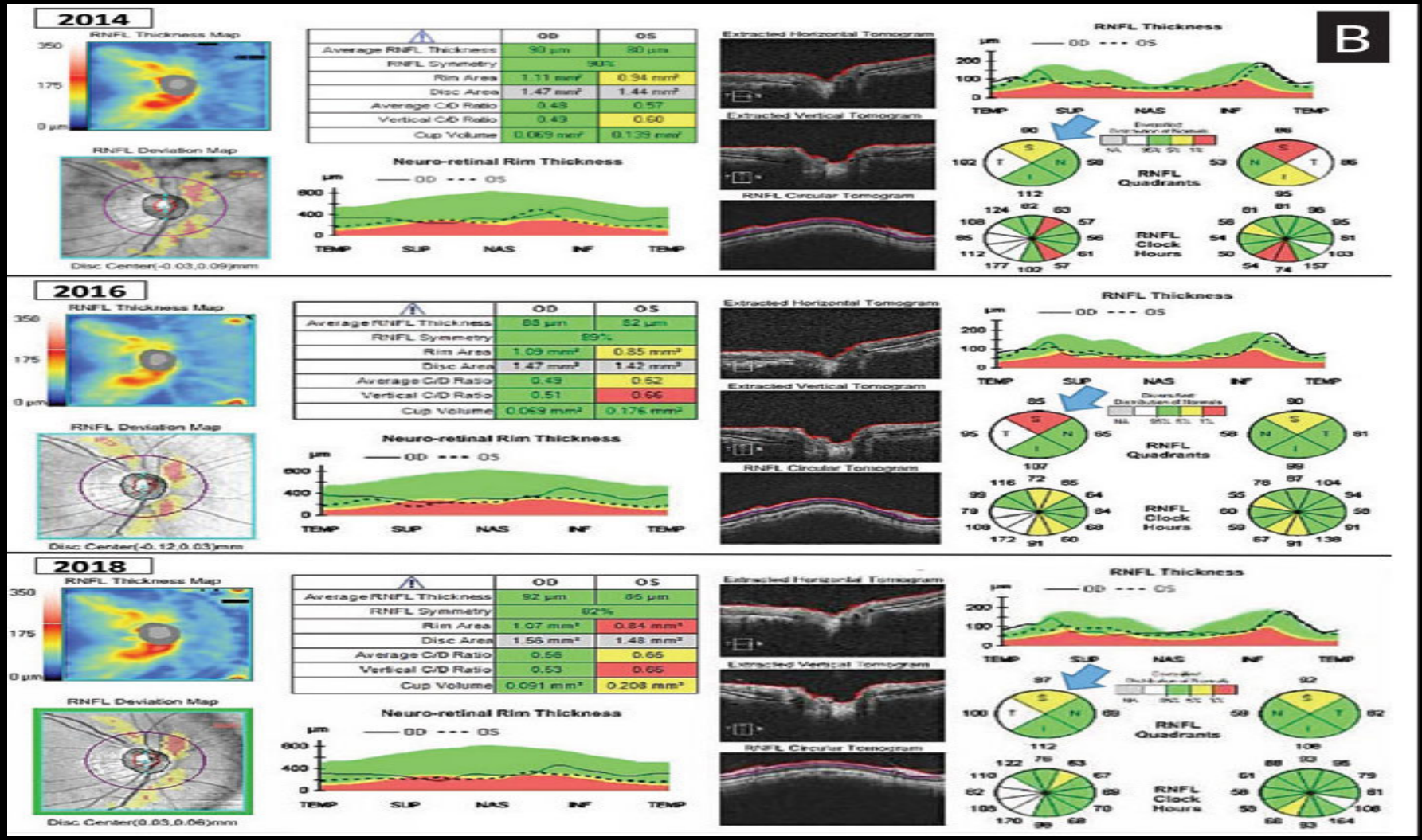
WHAT CONSTITUES OCT RNFL CHANGE?

- AGE RELATED CHANGE VS GLAUCOMA CHANGE
  - CIRRUS -0.48 um/year VS -0.98 um/year
  - SPECTRALIS -0.60 um/year VS -2.21 um/year

  - RULE OF THUMB
    - AVG RNFL LOSS OF > -1.0 um / YEAR IS LIKELY CLINICALLY SIGNIFICANT

OCT RNFL EXAMPLE

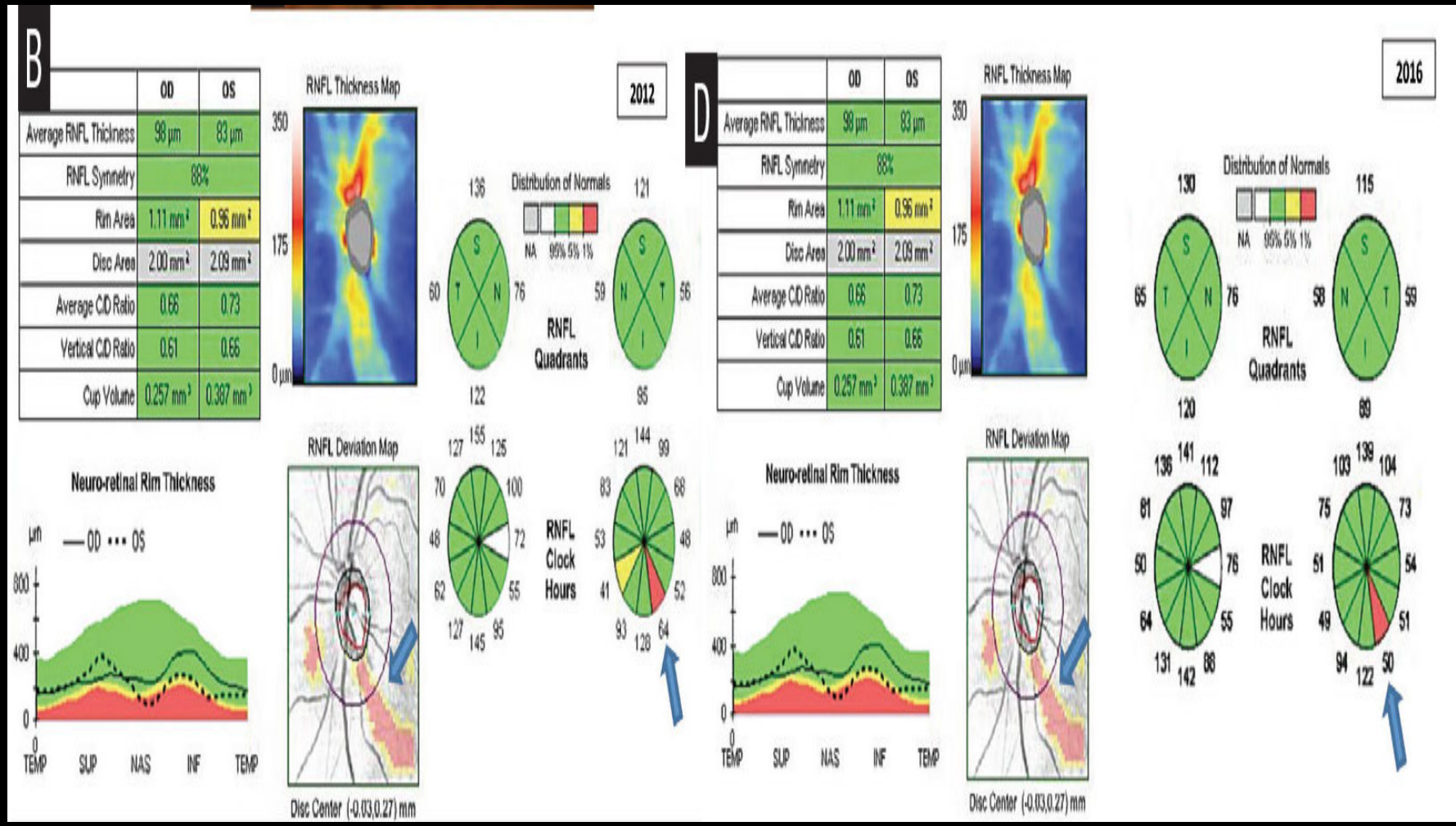
NO CHANGE



Saini C, Shen LQ. Monitoring Glaucoma Progression with OCT. Review of Ophthalmology 5/06/20.

OCT RNFL EXAMPLE

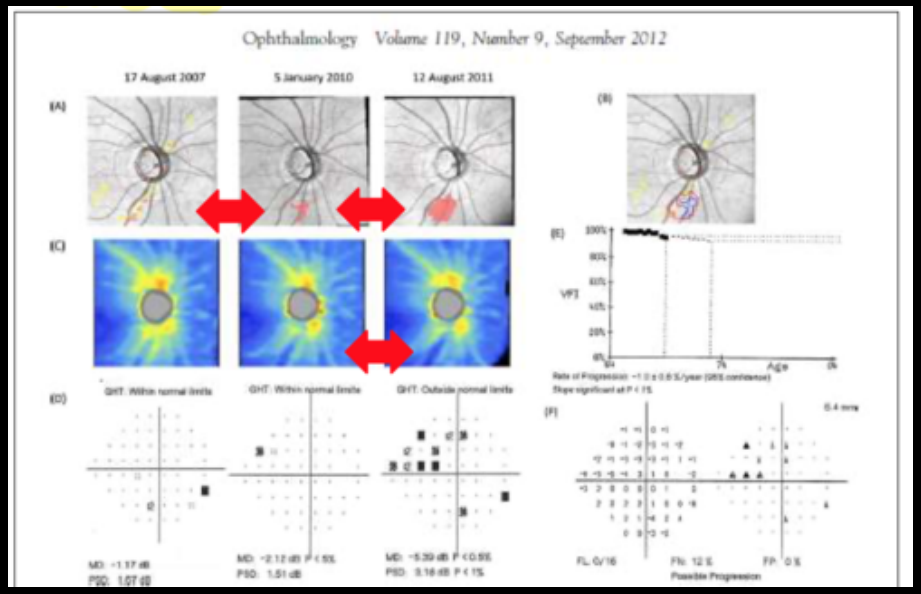
RNFL CHANGE

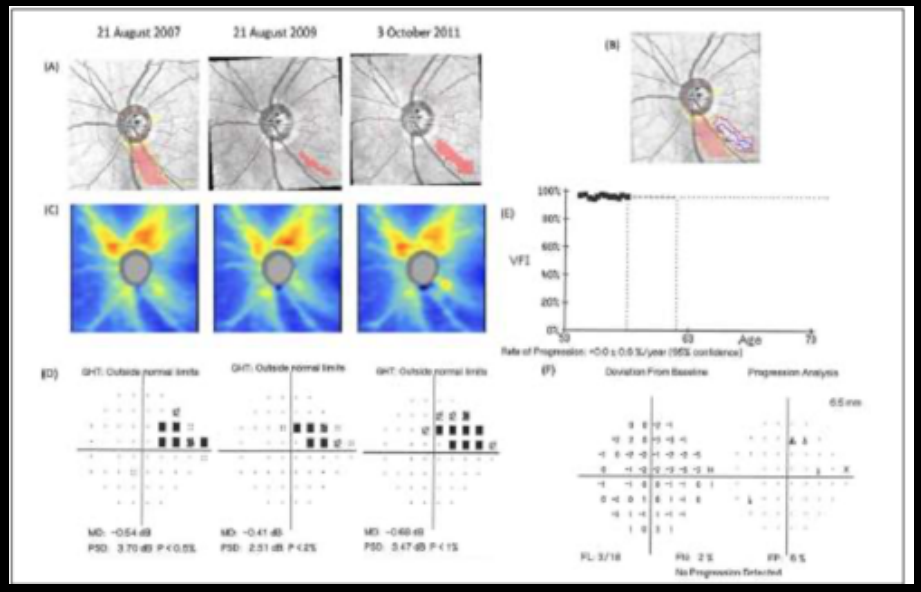


Saini C, Shen LQ. Monitoring Glaucoma Progression with OCT. Review of Ophthalmology 5/06/20.

OCT RNFL EXAMPLES

DEEPENING vs WIDENING

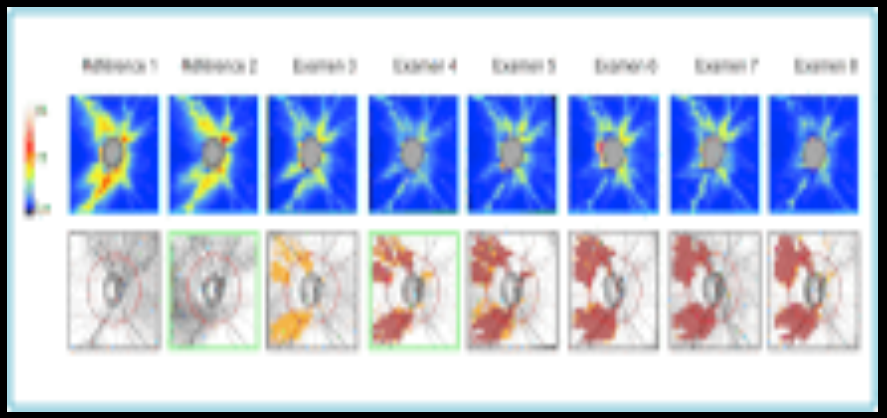


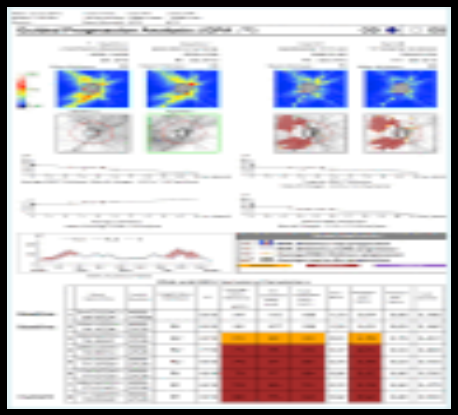


BOTH CORRESPOND WITH VF CHANGE

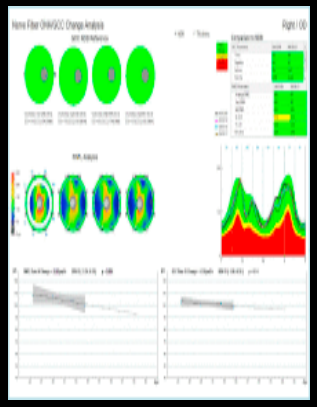
OCT SOFTWARE

FOR DETECTING RNFL PROGRESSION



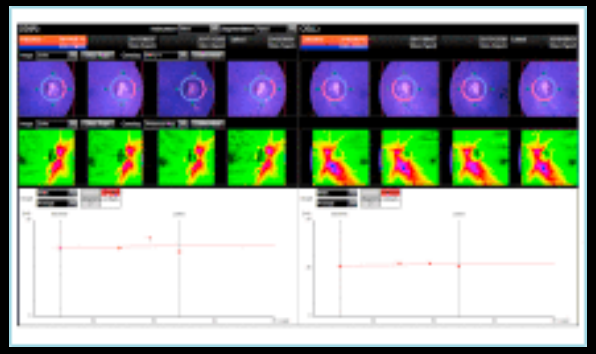


ZEISS CIRRUS

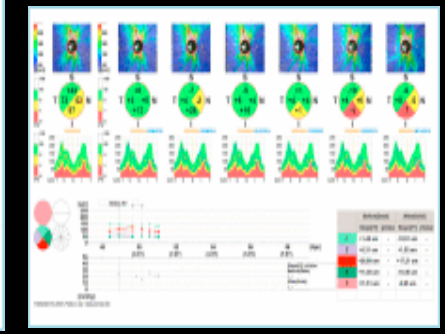


OPTOVUE AVANTI

HEIDELBERG SPECTRALIS



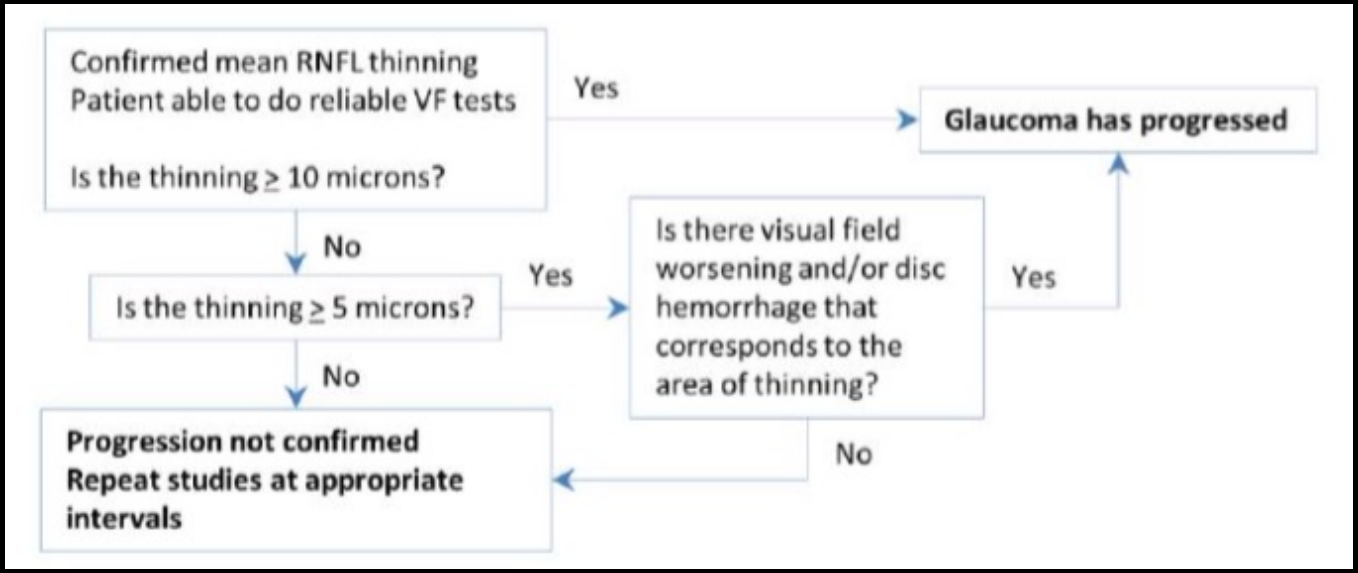
TOPCON 3D



NIDEK RS 3000

Journal Français d'Ophtalmologie Volume 42, Issue 5, May 2019, Pages 499-516

HAS THE OCT RNFL CHANGED?



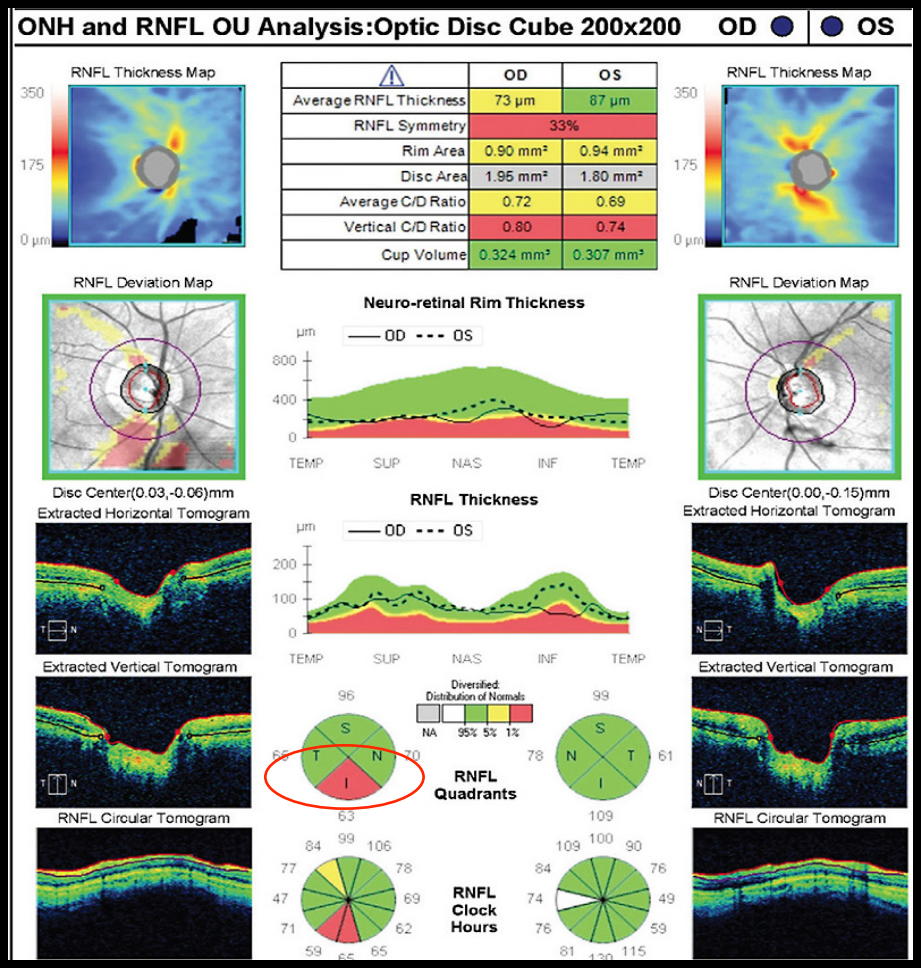
- 5 um CHANGE WITH VF PROGRESSION
- 10 um CHANGE WITH OR WITHOUT VF PROGRESSION

- CONFIRM IT. REPEAT THE OCT.

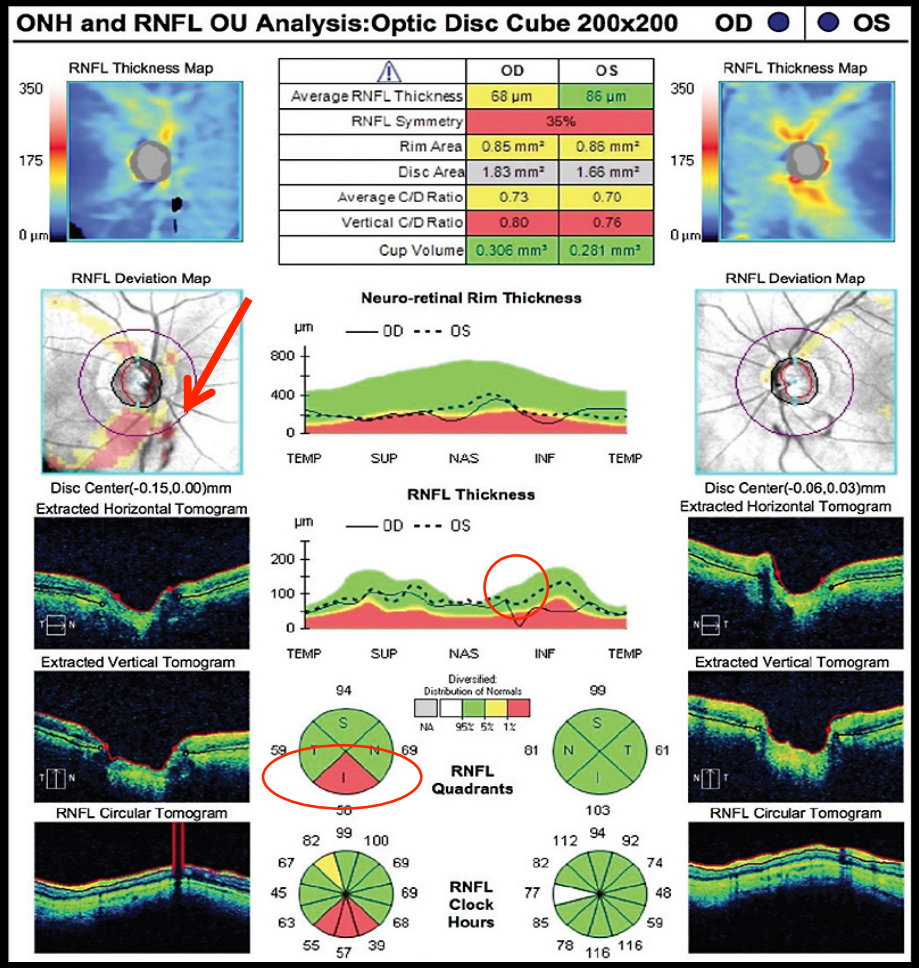
Drs. Chang, Ramulu and Hodapp Clinical Decisions in Glaucoma 2nd Edition, 2016

BE AWARE OF FALSE PROGRESSION

FALSE POSITIVES



	OD	OS
Average RNFL Thickness	73 µm	87 µm
RNFL Symmetry	33%	
Rim Area	0.90 mm²	0.94 mm²
Disc Area	1.95 mm²	1.80 mm²
Average C/D Ratio	0.72	0.69
Vertical C/D Ratio	0.80	0.74
Cup Volume	0.324 mm³	0.307 mm³



	OD	OS
Average RNFL Thickness	68 µm	86 µm
RNFL Symmetry	35%	
Rim Area	0.85 mm²	0.86 mm²
Disc Area	1.83 mm²	1.66 mm²
Average C/D Ratio	0.73	0.70
Vertical C/D Ratio	0.80	0.76
Cup Volume	0.306 mm³	0.281 mm³

Francis, BA, Chopra V. Glaucoma Progression Detection, Part 2.
Ophthalmology Management 11/01/18

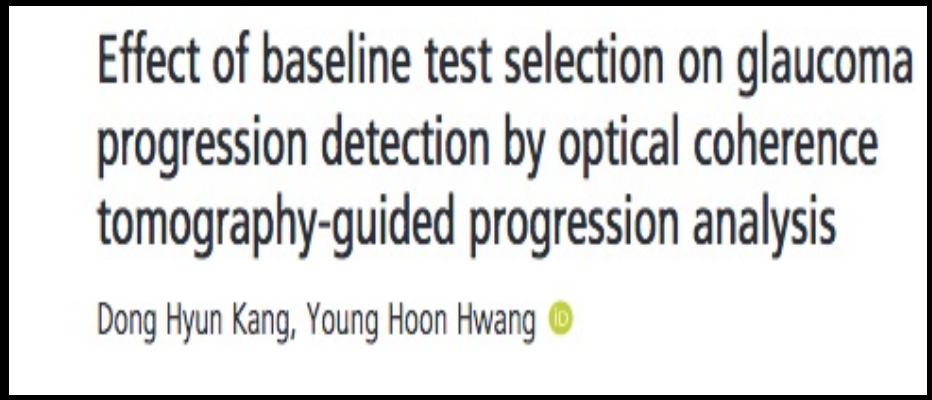
CAUTION

- RULE OF FIVE MAY NOT BE RELIABLE 5/06/21 UPDATE
  - After five years of testing, the cumulative proportion of false positives based on ≥5µm RNFL losses between visits was 24.8% in the controls.
  - While 40.6% of glaucoma eyes were diagnosed with progression at five years, only 15.8% would have been considered "true" progression after subtracting the cumulative proportion of false positives (40.6% - 24.8%).
  - Researchers found that the cumulative proportion of an intervisit gain of ≥5µm at five years was 27.4% in glaucoma eyes, which suggested that only 13.2% of eyes with glaucoma had truly progressed.
  - The study concluded that applying the intervisit "rule of five" could result in a high cumulative proportion of false positives over time and lead to unnecessary interventions in patients whose disease is stable.
  - Researchers call for more specific diagnostic criteria to help practitioners determine whether patients are progressing from glaucoma in order for timely and appropriate therapy escalation.

CAUTION
12/02/21

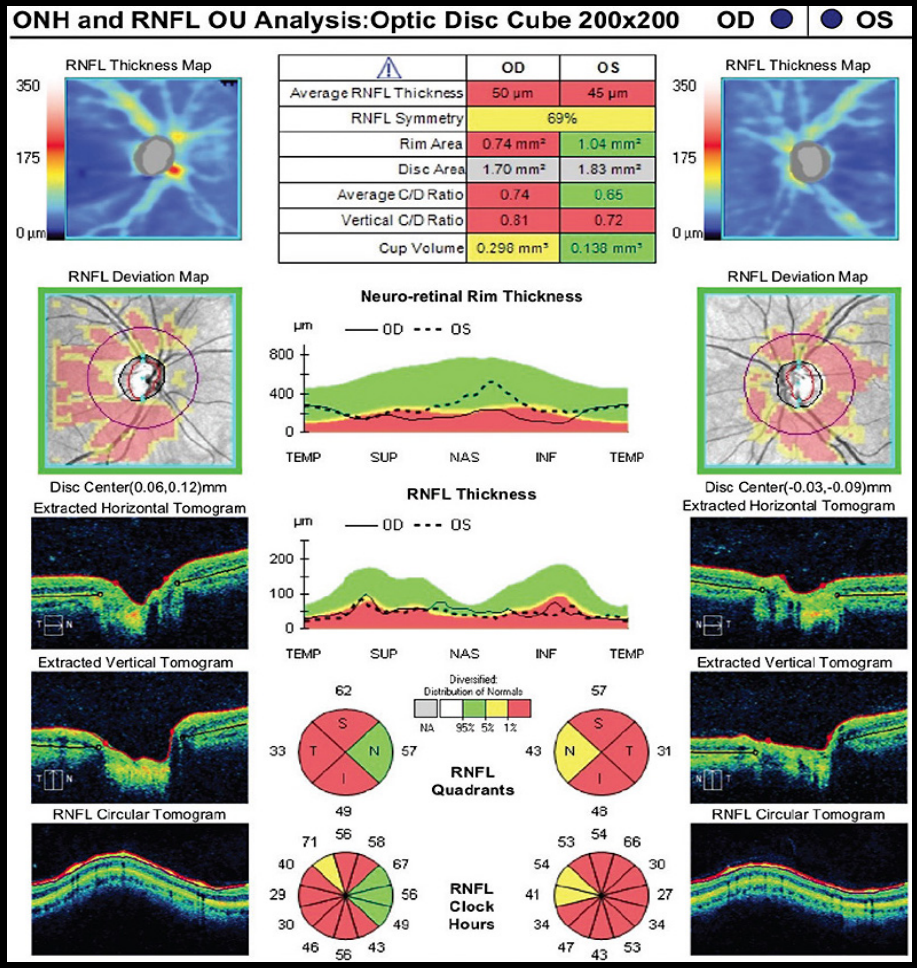
- Glaucomatous progression is not linear and the rate of progression is not consistent
- Thus, when progression deceleration is expected, the baseline should be newly set to avoid progression overestimation, especially during treatment escalation.

- Regarding the effect of baseline test selection on progression detection, a lower influence on GCIPL compared to RNFLthickness was found



REMEMBER
THE OCT RNFL FLOOR

- AT ABOUT
  - 57 um CIRRUS
  - 49.2 um SPECTRALIS
  - 64.7 um RTVue
- WHAT'S BEING MEASURED IF NOT THE RNFL?
  - MULLER CELLS, ASTROCYTES, GLIAL CELLS, BLOOD VESSELS
- AT THIS POINT, THE OCT RNFL IS NOT USEFUL
  - INSURANCE COMPANIES MAY NOT PAY FOR OCT
  - USE VISUAL FIELD
  - GANGLION CELL ANALYSIS



	OD	OS
Average RNFL Thickness	50 µm	45 µm
RNFL Symmetry	69%	
Rim Area	0.74 mm²	1.04 mm²
Disc Area	1.70 mm²	1.83 mm²
Average C/D Ratio	0.74	0.65
Vertical C/D Ratio	0.81	0.72
Cup Volume	0.298 mm³	0.138 mm³

Francis, BA, Chopra V. Glaucoma Progression Detection, Part 2. Ophthalmology Management 11/01/18

WHAT CONSTITUES CIRRUS OCT GCC CHANGE?

- CIRRUS GCA
  - = GCIPL (GANGLION CELL LAYER + INNER PLEXIFORM LAYER)

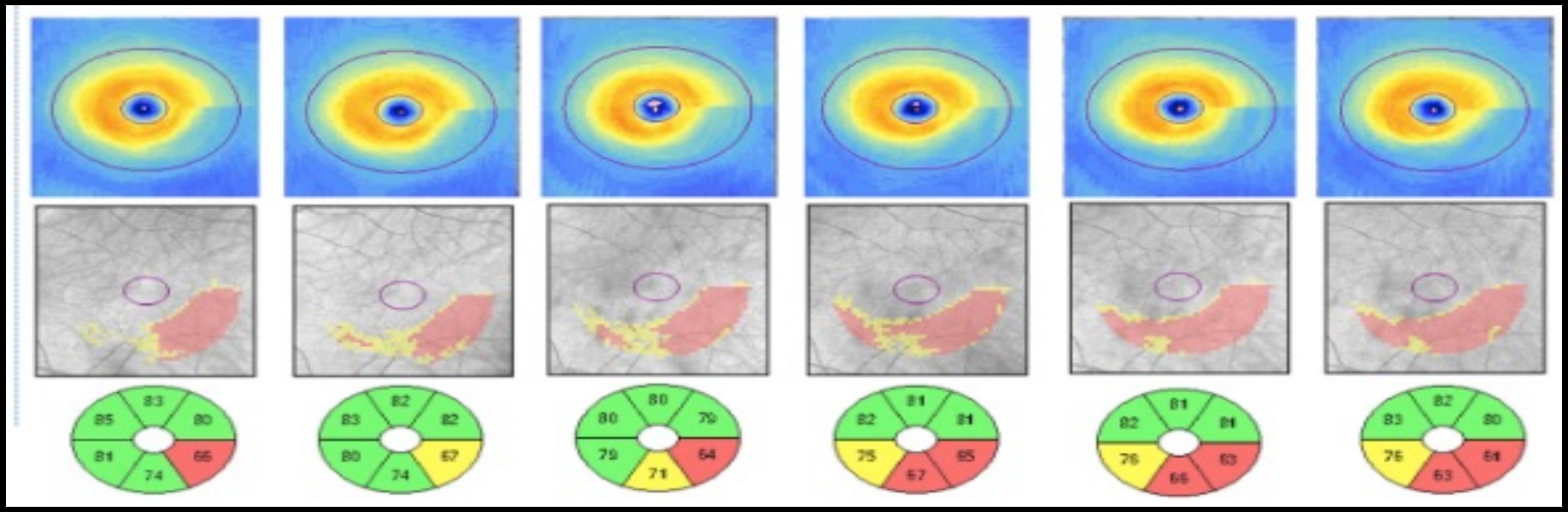
- NORMALS 82.1 +/- 6.2 um
- EARLY GLAUCOMA 75.2 +/- 6.8 um
- MODERATE 64.4 +/- 8.4 um
- ADVANCED 55.6 +/- 7.6 um

- AGE RELATED CHANGE
  - -0.31 um/year

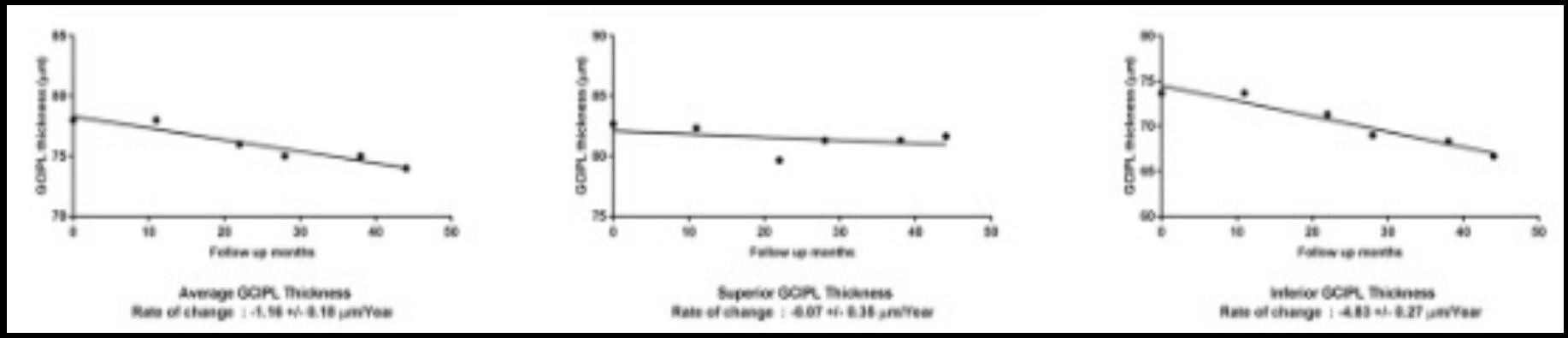
  - RULE OF THUMB
    - AVG GCIPL THICKNESS CHANGE OF > 4.0 um SUGGESTS PROGRESSION

- CIRRUS GCIPL FLOOR APPROXIMATELY 45 um

OCT GCIPL EXAMPLE



81/74/66 80/74/67 79/71/64 75/67/65 76/65/63 75/63/61



Lee, Won June et al. "Trend-based Analysis of Ganglion Cell-Inner Plexiform Layer Thickness Changes on Optical Coherence Tomography in Glaucoma Progression." Ophthalmology vol. 124,9 (2017): 1383-1391.

REMINDER

- IF OCT APPEARS TO HAVE PROGRESSED
  - REPEAT TO CONFIRM
    - SAME DAY, 1 WEEK, 1 MONTH

- THE OCT RNFL CAN FLUCTUATE
  - IT IS NOT PERFECT
    - DECENTRATION
    - PVD ASSOCIATED ERROR
    - SEGMENTATION ERROR
    - POOR SIGNAL STRENGTH

WHAT CONSTITUES VISUAL FIELD CHANGE?

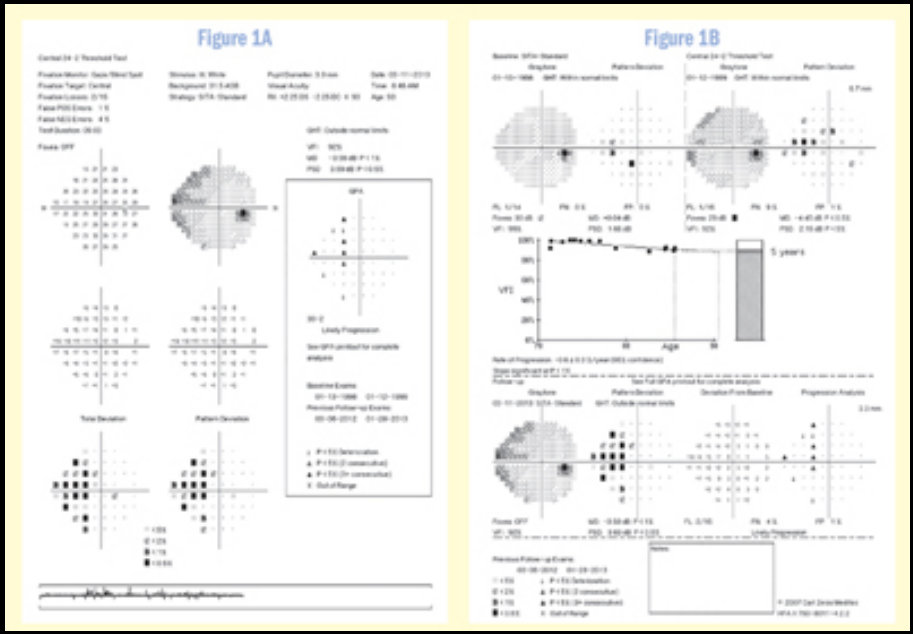
- ONE OF THE LEAST LIKELY AGREED UPON THINGS IN GLAUCOMA
  - EVEN BY EXPERTS
  - MULTIPLE DIFFERENT METHODS HAVE BEEN USED IN CLINICAL TRIALS

- VISUAL FIELD PROGRESSION
  - NEW DEFECT
  - EXPANSION OF DEFECT
  - DEEPENING OF DEFECT
  - ENTIRE FIELD HAS DECREASED SENSITIVITY

- CHANGE MUST BE REPEATED / CONFIRMED
  - DETERMINE IF PROGRESSION IS GLAUCOMA OR SOMETHING ELSE
  - THE MORE DAMAGED A VF IS, THE MORE VARIABLE IT MAY BE

ZEISS HFA PROGRESSION SOFTWARE

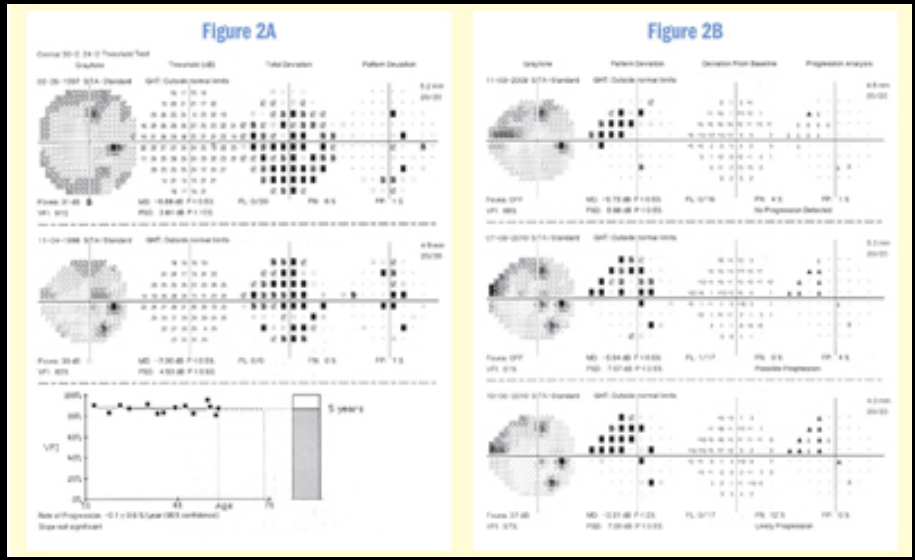
- EVENT ANALYSIS (NEED 3 TESTS)
  - GPA FIRST 2 TESTS ARE BASELINE
    - CAN BE CHANGED
  - NEXT TESTS COMPARED
    - PD TEST LOCATIONS ANALYZED POINT BY POINT
  - IF POINT CHANGES SIGNIFICANTLY
    - ON ONE TEST OPEN TRIANGLE
    - ON TWO TESTS HALF TRIANGLE
    - ON 3 TESTS SOLID TRIANGLE
  - POSSIBLE PROGRESSION
    - SAME 3 OR MORE POINTS FLAGGED ON TWO TESTS IN A ROW
  - LIKELY PROGRESSION
    - SAME 3 OR MORE POINTS ARE FLAGGED ≥ 3 TESTS IN A ROW
  - IS NOT PERFECT
    - FOCALLY ORIENTED SO IT WILL MISS AN OVERALL PROGRESSION



MURRAY FINGERET, OD
https://www.ophthalmicprofessional.com/issues/2014/january-2014/glaucoma-and-guided-progression-analysis

ZEISS HFA PROGRESSION SOFTWARE

- TREND ANALYSIS
  - VFI (5 EXAMS OVER 3 YRS)
  - SUMMARIZES ENTIRE FIELD
    - 0 = BLIND
    - 100% = NORMAL
    - PTS NOTICE AT AROUND VFI 70%
  - CENTRAL POINTS = MORE WEIGHT
  - QUANTIFIES RATE OF CHANGE
    - NEGATIVE SLOPE = WORSENING
    - AVG RATE = -1.0 dB / YEAR
      - = 30 YRS TO BLINDNESS
    - SLOW PROGRESSORS
      - = SHALLOW SLOPE
      - < -1.0 db / YEAR
    - FAST PROGRESSORS
      - = STEEP SLOPE
      - > -1.0 dB / YEAR



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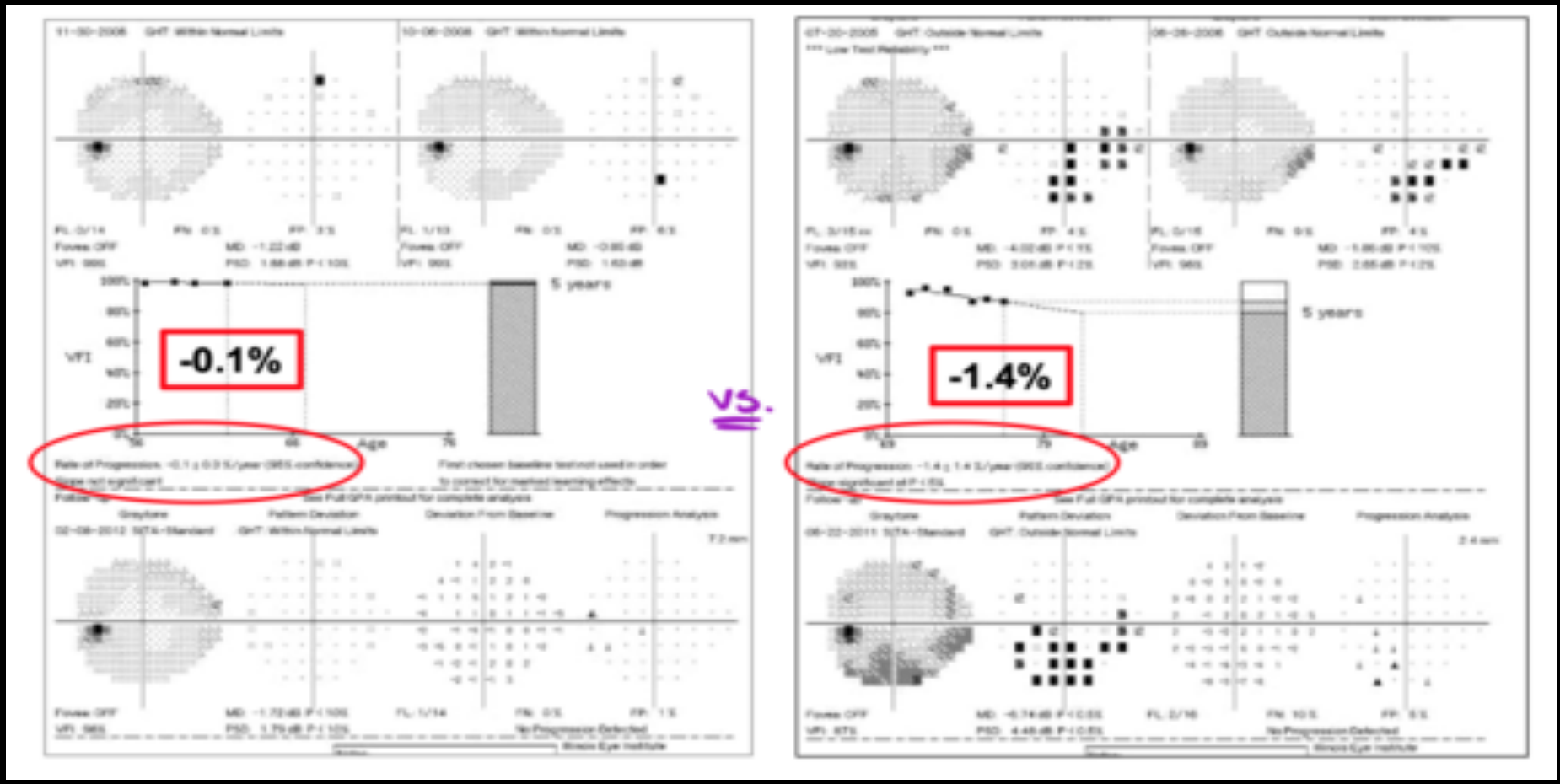
https://www.ophthalmicprofessional.com/issues/2014/january-2014/glaucoma-and-guided-progression-analysis

VFI

NOT SIGNIFICANT vs SIGNIFICANT



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https://www.ophthalmicprofessional.com/issues/2014/
january-2014/glaucoma-and-guided-progression-analysis

WHAT CONSTITUES VISUAL FIELD CHANGE?

- REPEATABLE
  - ON 2 CONSECUTIVE VISUAL FIELDS
- YOUR DETAILED ANALYSIS
  - IN A NORMAL AREA
  - IN A DAMAGED AREA
- HFAII OR III SOFTWARE ANALYSIS
  - GPA LIKELY PROGRESSION
  - SLOPE SIGNIFICANT AT P <1% ON VFI
  - DON'T FORGET THE GRAY SCALE!
    - SOMETIMES IT REALLY HELPS

HAP2 Criteria, Part III
Criteria for Visual Field Progression

In previously normal areas, any of the following on at least TWO consecutive fields:

- A single point that declines ≥ 10 dB in a previously normal area.
- Within the central 10° – two or more points each of which declines ≥ 5 dB compared to baseline.
- Outside the central 10° – a cluster of three or more points each of which declines ≥ 5 dB compared to baseline.

Within a preexisting defect, any of the following on at least TWO consecutive fields:

- A single point that declines ≥ 15 dB within a preexisting defect.
- Within the central 10° – any point that declines ≥ 10 dB.
- Outside the central 10° – a cluster of 3 or more points each of which declines ≥10 dB compared to baseline, or each of which declines ≥ 5 dB on THREE consecutive fields (the confirming points may differ if they are part of a contiguous cluster)

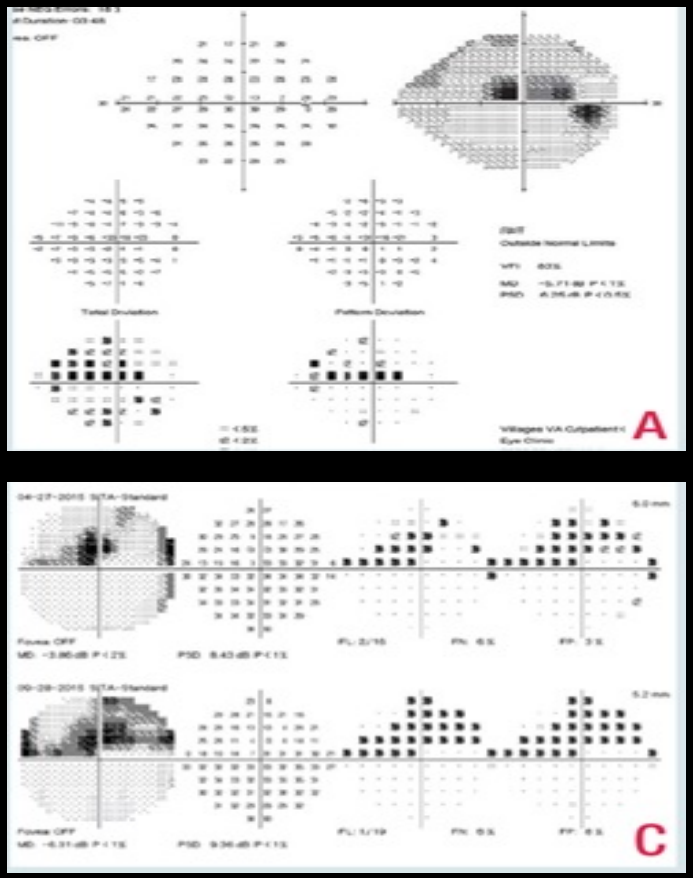
Either of the following on Guided Progression Analysis:

- A slope significant at p < 1% for Visual Field Index graph.
- A "Likely Progression" message on Guided Progression Analysis.

Drs. Chang, Ramulu and Hodapp
Clinical Decisions in Glaucoma 2nd Edition, 2016

THE 10-2 AND PROGRESSION

- MUCH MORE CHALLENGING BUT PROBABLY MORE IMPORTANT
  - NO SOFTWARE FOR PROGRESSION
  - CONSIDER
    - HOW DOES THE PATTERN LOOK COMPARED TO LAST ONE
    - COMPARE POINT BY POINT ANALYSIS
    - COMPARE MEAN DEVIATION STABILITY OR WORSENING
      - AND NOT A CATARACT
    - COMPARE GRAY SCALES
    - ASK THE PATIENT…
      - HOW DO THEY THINK VISION IS COMPARED TO LAST TIME?
- IF SUSPICIOUS, REPEAT
  - WORSE VF MORE LIKELY TO FLUCTUATE



Lifferth, A et. Al 10-2 Visual Field Testing: A Tool for All Glaucoma Stages. Review of Optometry 7/15/17.

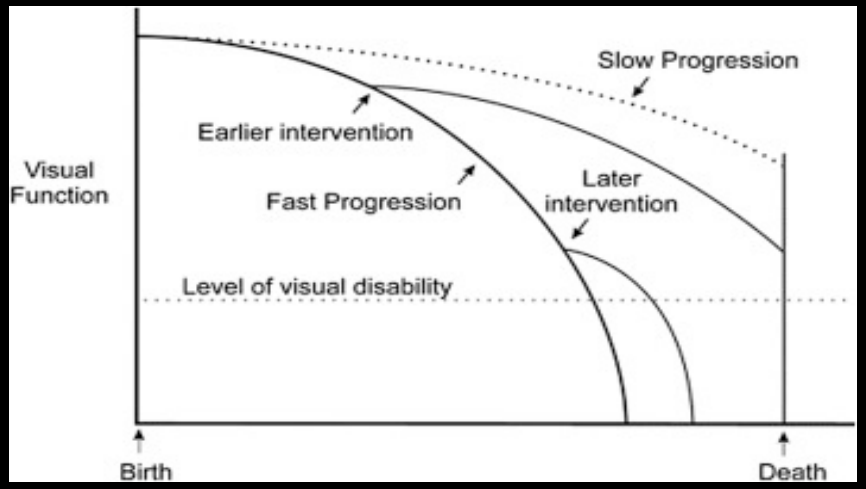
IT TAKES TIME TO DETERMINE VISUAL FIELD PROGRESSION

- HOWEVER…
  - DO NOT WAIT
  - GET 3 BASELINE EARLY
  - GET 5-6 WITHIN 2 YEARS
- IF SUSPCIOUS FOR CHANGE
  - REPEAT IT
  - REPEAT OFTEN

Years Needed to Detect Progression with Visual Fields

Median Rate of Change	One Test per Year	Two Tests per Year	Three Tests per Year
-0.25 dB/year	11.4 years	9.2 years	8.0 years
-0.50 dB/year	7.3	5.7	5.0
-1.00 dB/year	4.8	3.6	3.2
-2.00 dB/year	3.3	2.4	2.1

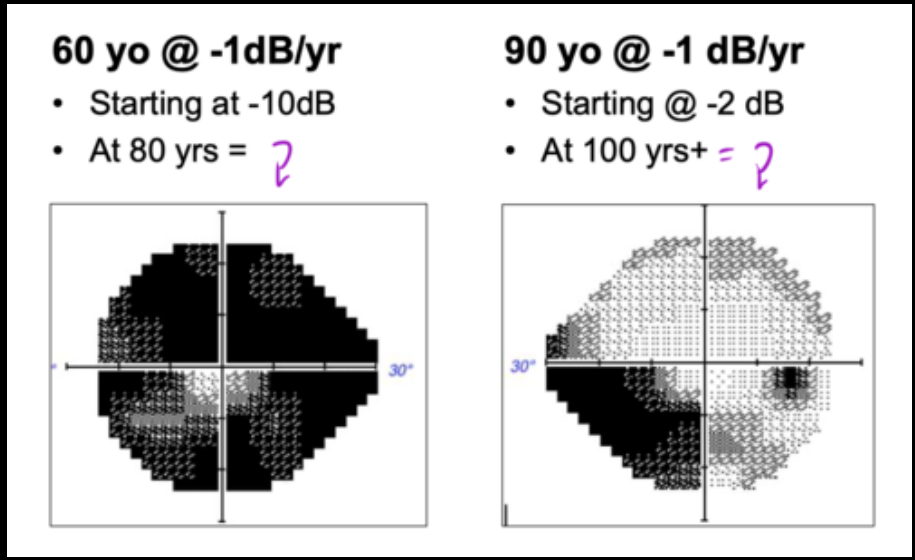
Kent, C. Using Tech to Track Glaucoma Progression. Review of Ophthalmology. 12/11/17.



De Moraes, C Gustavo et al. "Detection and measurement of clinically meaningful visual field progression in clinical trials for glaucoma." Progress in retinal and eye research vol. 56 (2017): 107-147

A FEW THINGS TO REMEMBER

- AGE AND STARTING POINT DO MATTER
- SOME PATIENTS PROGRESS NO MATTER WHAT IS DONE
- THINGS OTHER THAN IOP ARE INVOLVED IN GLAUCOMA PROGRESSION
  - ONH PERFUSION
  - APOPTOSIS
  - OXIDATIVE STRESS
  - ETC.



FOLLOW-UP INTERVAL

- INITIATE DROPS
  - FOLLOW IN 4-6 WKS
  - IF AT TARGET
    - SEE IN 3 MOS
  - IF NOT AT TARGET
    - CHANGE/ADD TX SEE 4-6 WKS
- IF AT TARGET
  - MILD-MODERATE OAG
    - 4-6 MOS (2-3X / YEAR)
  - SEVERE
    - 3-4 MOS (3-4X/YEAR)
  - NEVER ONCE A YEAR!
- IF PROGRESSION
  - REPEAT TESTING RTC 1 WK-2 MOS
  - REPEATABLE WORSENING
    - CHANGE/ADD TX RTC 4-6 WKS

Target IOP Achieved	Progression of Damage	Duration of Control (mos)	Approximate Follow-up Interval (mos)†
Yes	No	≤6	6
Yes	No	>6	12
Yes	Yes	NA	1–2
No	Yes	NA	1–2
No	No	NA	3–6

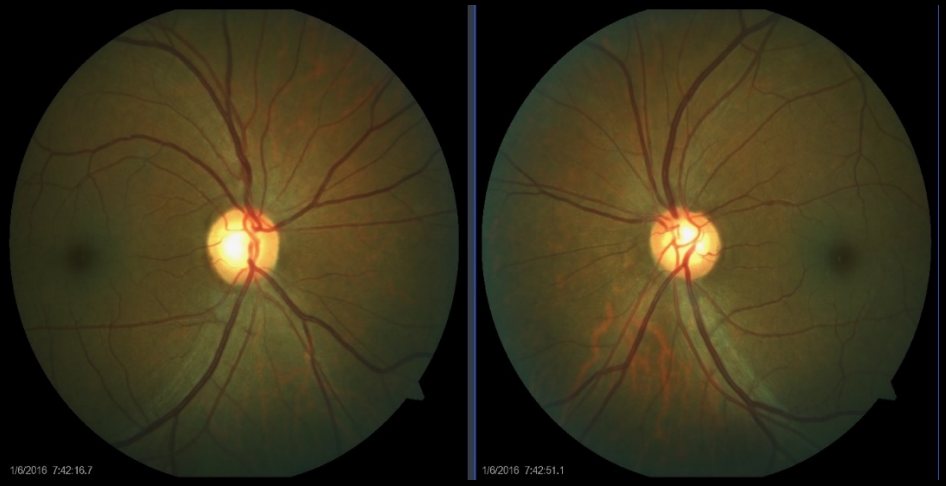
AAO PPP 2020

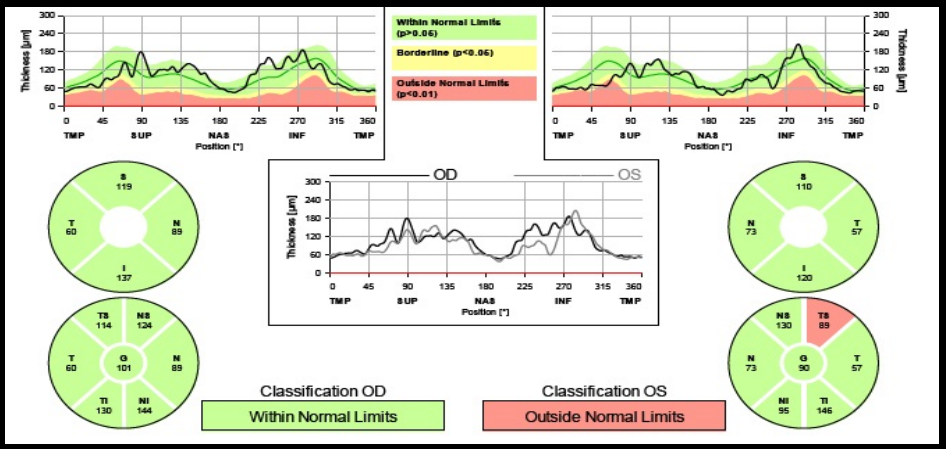
- **OH and stable mild-stage disease:** Every 3–6 months, depending on the duration of IOP control.
- **Stable moderate-stage disease:** Every 2–4 months, depending on the duration of stability and the IOP.
- **Stable severe disease:** Every 1–3 months, depending on the duration of stability and the IOP.
- **Recently established stability:** Every 1–3 months, depending on both the severity of the disease and the IOP.
- **Unstable disease:** Cases in which IOP, ON, or VF is unstable require adjustment of therapy, which could involve weekly or biweekly follow-up for a brief period or until stability is achieved.

AOA CPG 2010

YOUR PATIENT HAS GLAUCOMA…NOW WHAT? HAS HE CHANGED?

60 / AA / M
IOP: 19-25/24-28, PACHYM: 511/508, NO FAM HX, NO PIG / NO PEX
GONIO CBB 360 OU
TARGET RANGE: OD 17-20 / OS 20-23

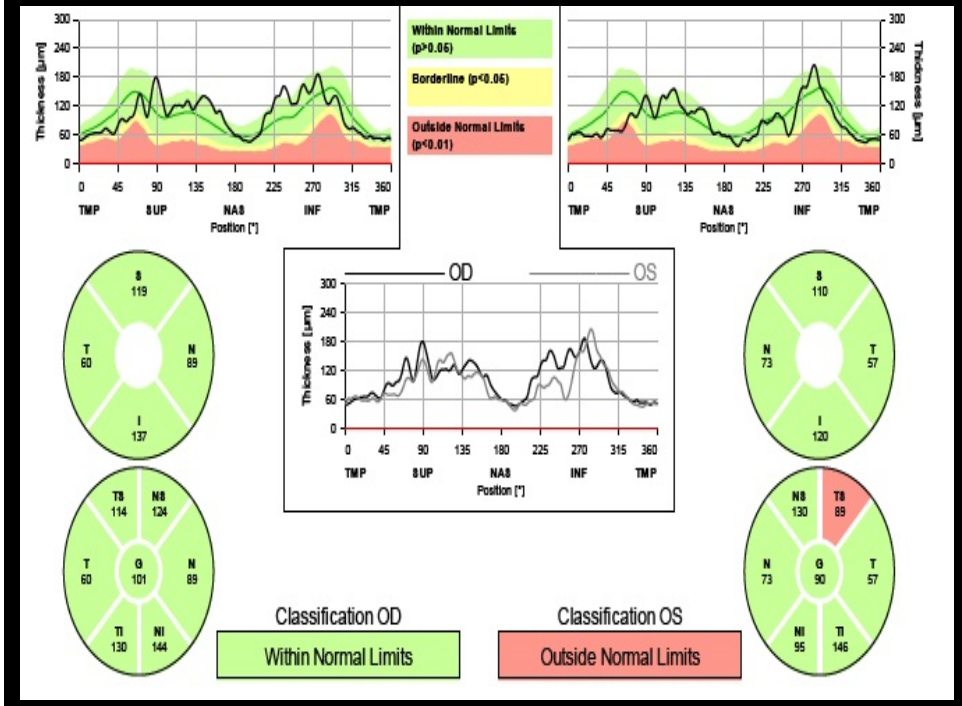


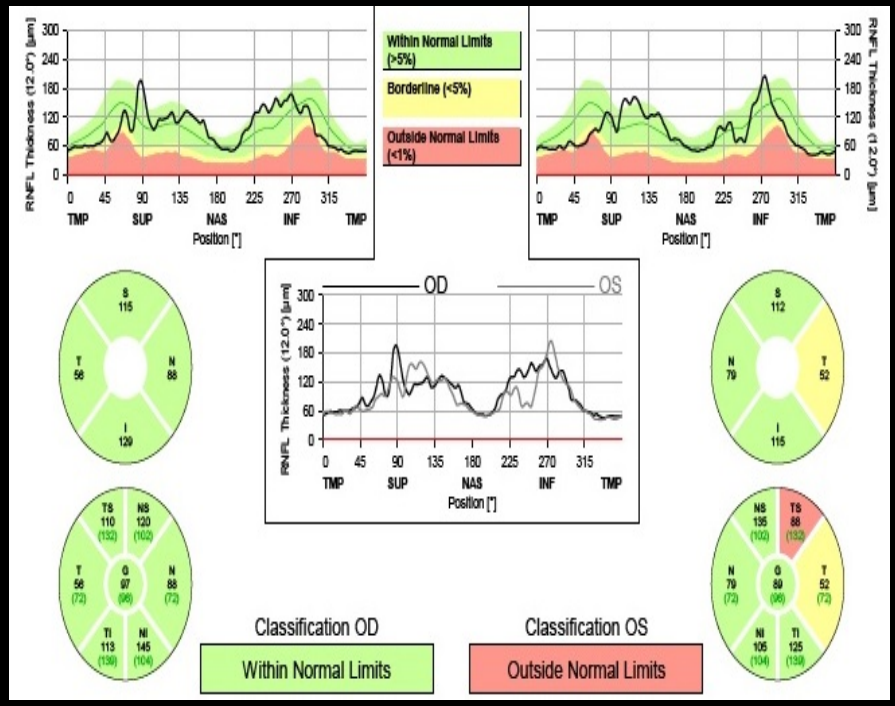


IOP DATA	VISIT 1	VISIT 2 (1 mo)	VISIT 3 (3 mos)	VISIT 4 (4 mos)	2016-2020 Seen q 6 mos
OD	19	20	25	16	13-18
OS	28	24	26	16	14-18
MEDS:	None	None	None	Latanoprost qhs ou	Latanoprost qhs ou

YOUR PATIENT HAS GLAUCOMA…NOW WHAT? HAS HE CHANGED?

60 / AA / M
IOP: 19-25/24-28, PACHYM: 511/508, NO FAM HX, NO PIG / NO PEX
GONIO CBB 360 OU
TARGET RANGE: OD 17-20 / OS 20-23
ON LATANOPROST QHS OU X 4 YEARS, IOP 13-18 OD / 14-18 OS

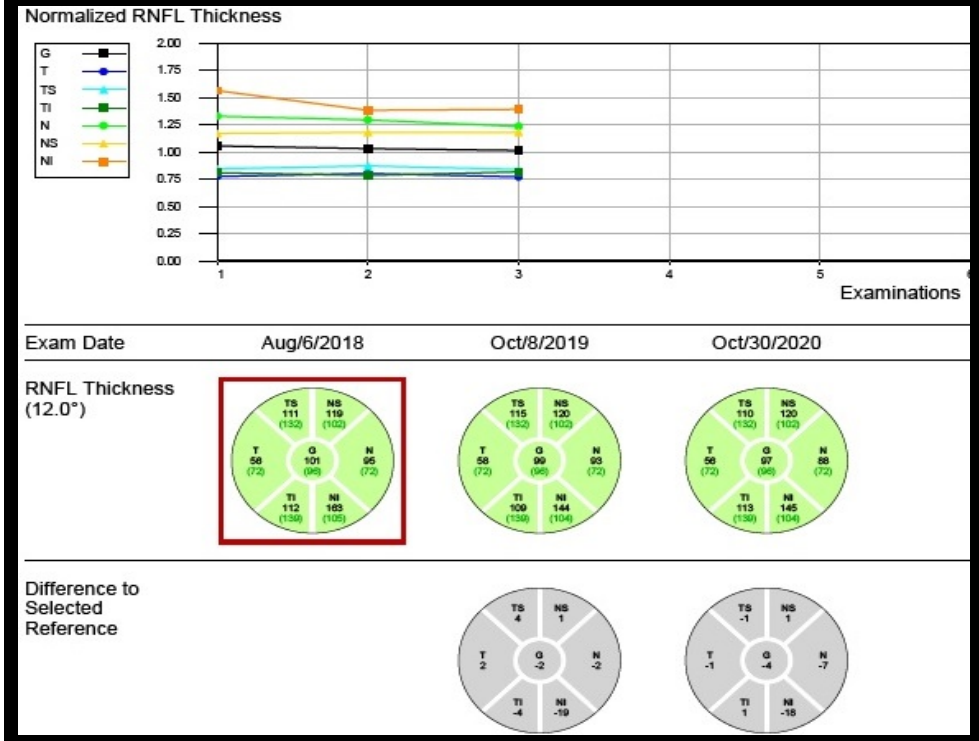


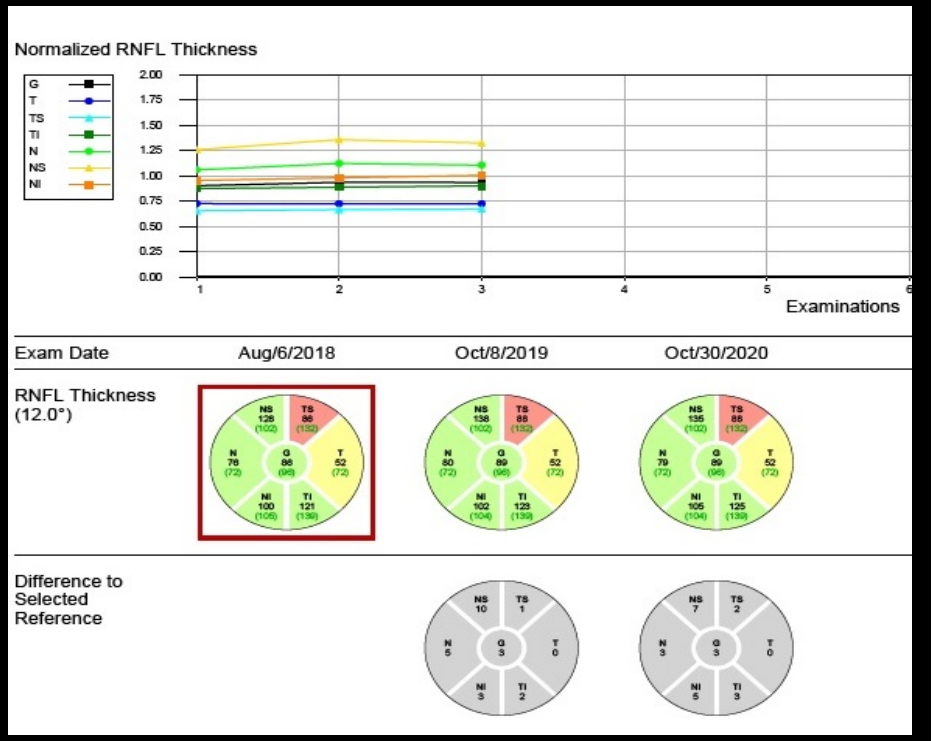


SPECTRALIS OCT RNFL 2016 vs 2020
OD Avg -4, TS -4, TI -17 = suspicious
OS avg -1, TS -1, TI -21 = suspicious

YOUR PATIENT HAS GLAUCOMA…NOW WHAT? HAS HE CHANGED?

60 / AA / M
IOP: 19-25/24-28, PACHYM: 511/508, NO FAM HX, NO PIG / NO PEX
GONIO CBB 360 OU
TARGET RANGE: OD 17-20 / OS 20-23
ON LATANOPROST QHS OU X 4 YEARS, IOP 13-18 OD / 14-18 OS

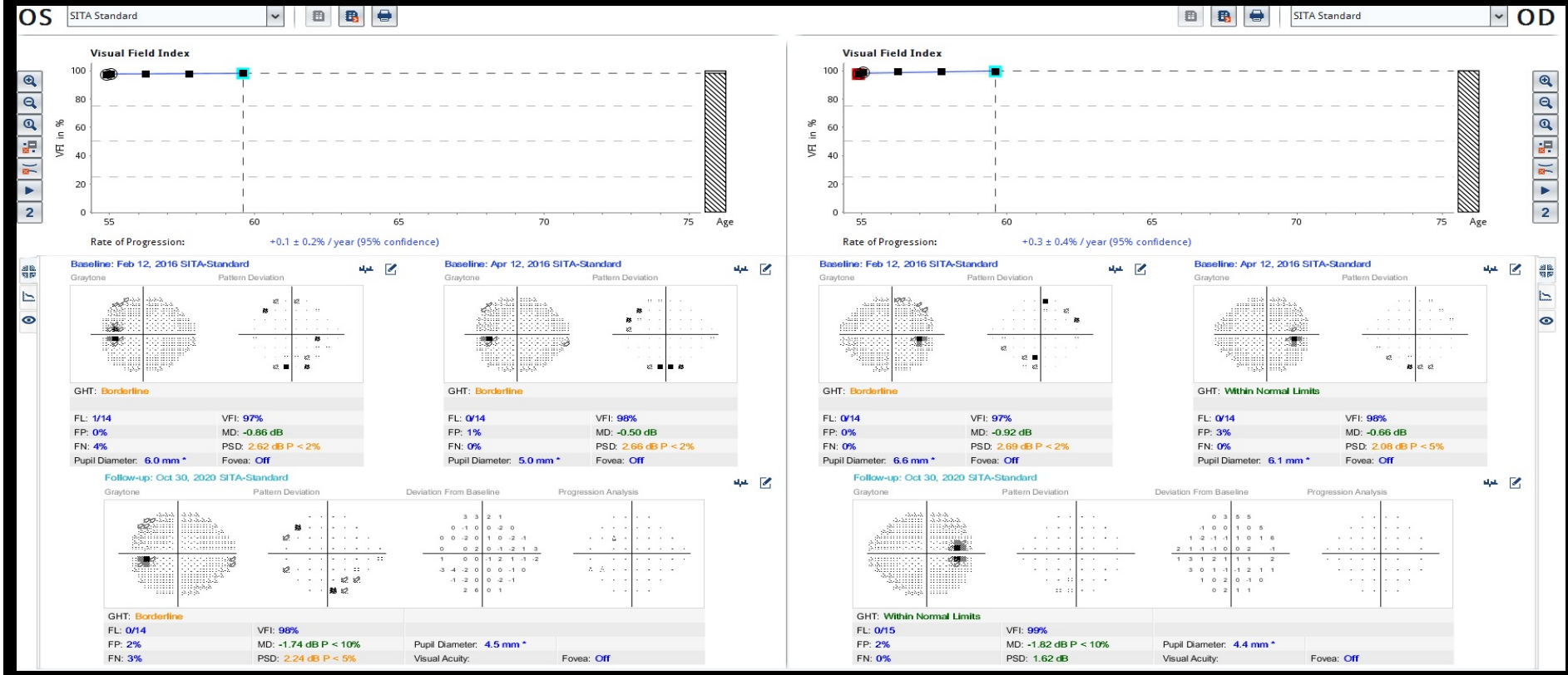




SPECTRALIS OCT RNFL 2018-2020 (NOT SURE WHY 2016 NOT INCLUDED)
OD avg -4, TS -1, TI +1 vs 8/18 = stable // avg -2, TS -5, TI +4 = TS suspicious vs 10/19
OS avg +1, TS 2, TI 3 vs 8/18 = stable // avg 0, TS 0, TI +2 = stable vs 10/19

YOUR PATIENT HAS GLAUCOMA…NOW WHAT? HAS HE CHANGED?

60/ AA / M
IOP: 19-25/24-28, PACHYM: 511/508, NO FAM HX, NO PIG / NO PEX
GONIO CBB 360 OU
ON LATANOPROST QHS OU X 4 YEARS, IOP 13-18 OD / 14-18 OS



VF 24-2 SITA STD
OD APPEARS STABLE
OS APPEARS SUSPICIOUS INF TEMP (WILL NEED TO BE REPEATED TO CONFIRM)

QUESTION

YOUR PATIENT HAS GLAUCOMA.

YOU HAVE COLLECTED BASELINE DATA.

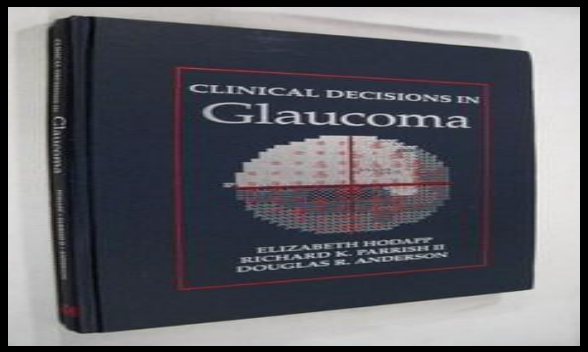
YOU HAVE SET A TARGET IOP.

YOU HAVE LOWERED THE IOP.

YOU HAVE MONITORED FOR CHANGE.

NOW WHAT?

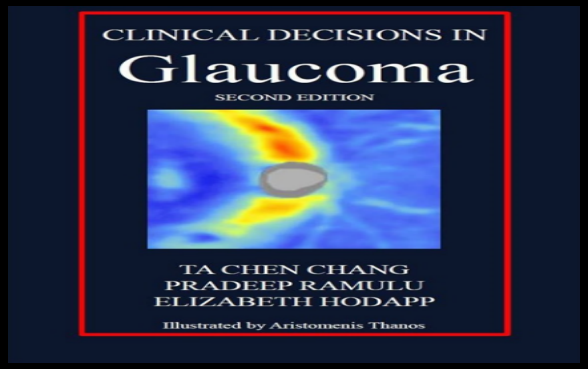
NOW WHAT?



Drs. Hodapp, Parrish and Anderson
Clinical Decision in Glaucoma 1993

and again in

Drs. Chang, Ramulu and Hodapp
Clinical Decisions in Glaucoma 2nd Edition, 2016



There are five basic steps to follow in managing a patient with glaucoma:

1. Establish a good baseline.
2. Set a reasonable target for intraocular pressure (IOP).
3. Lower the pressure.
4. Follow up with the patient to see if the target pressure is maintained and if the glaucomatous damage progresses.
5. Modify the target pressure and treatment as indicated by the patient's course.

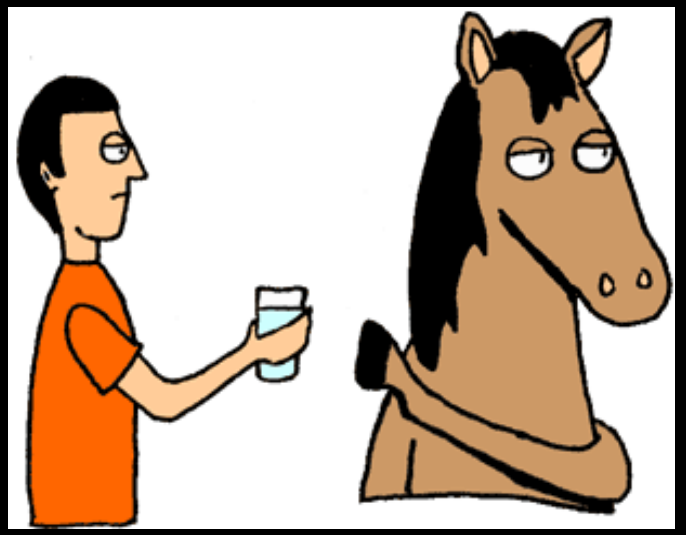
5. MODIFY TARGET PRESSURE AND TREATMENT AS NEEDED

TARGET IOP ADJUSTMENTS

- IF NOT AT TARGET
  - DON'T PANIC
  - A VARIABILITY OF ± 5% IS ACCEPTABLE
  - CAN ALWAYS RECHECK IN 1 DAY / WEEK / MONTH
  - HOWEVER…
    - DON'T LET IT STAY ABOVE THE TARGET FOR VERY LONG
- CONSIDER ADHERENCE
  - DISCUSS IMPORTANCE OF MEDICATION USAGE WITH PATIENT
    - CHECK AGAIN IN 4 WEEKS

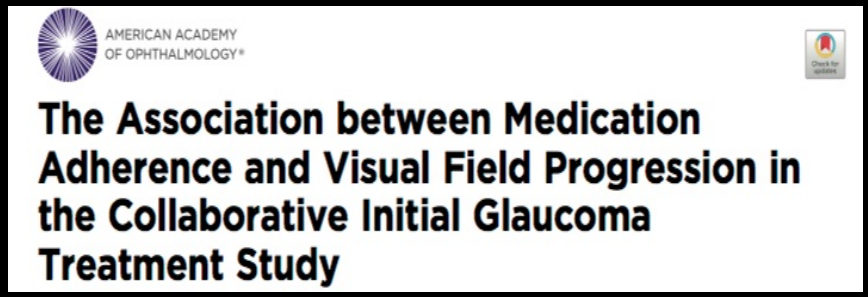
IF NO RESPONSE…

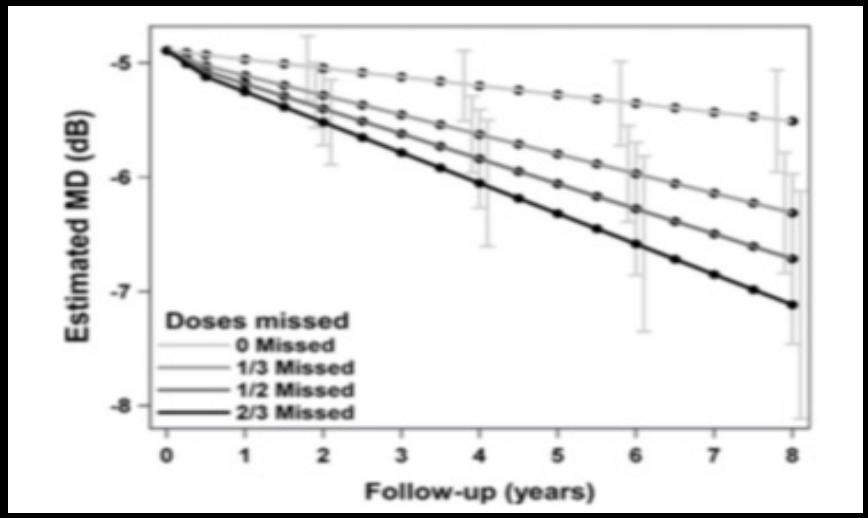
- BEFORE CHANGING TO ANOTHER COMBINATION, ADD ANOTHER MEDICATION OR REFERRING
  - MAKE SURE PATIENT IS ADHERENT
- ADHERENCE
  - HOW WELL A PATIENT TAKES THEIR MEDICATION ACCORDING TO THE RECOMMENDED DOSING SCHEDULE



ADHERENCE IS IMPORTANT

- CIGTS
  - COMPARED MEDICATION TO TRABECULECTOMY FOR NEWLY DIAGNOSED GLAUCOMA
  - 607 PATIENTS, Q6 MOS X 10 YRS
  - TELEPHONE QUESTION
    - "DID YOU HAPPEN TO MISS ANY DOSE OF YOUR MEDICATION YESTERDAY?"
  - RESULTS
    - 306 HAD ADHERENCE DATA
    - 46% NEVER MISSED DOSE
      - -0.62 dB ON MD
        - SIMILAR TO AGING
    - 37% MISSED 1/3
      - -1.42 dB on MD
    - 10% MISSED 1/3-1/2
    - 7% MISSED > 2/3
      - -2.23 dB ON MD

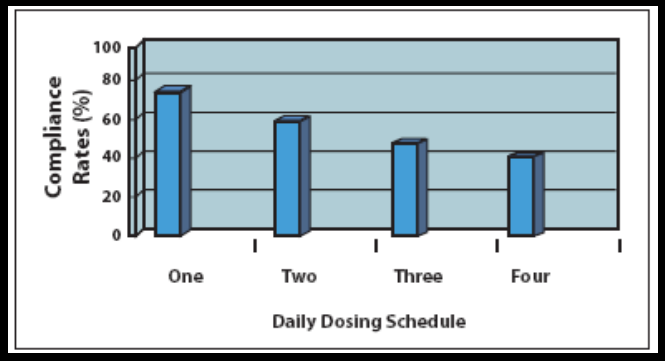




Newman-Casey, Paula Anne et al. "The Association between Medication Adherence and Visual Field Progression in the Collaborative Initial Glaucoma Treatment Study." *Ophthalmology vol. 127,4 (2020): 477-483*

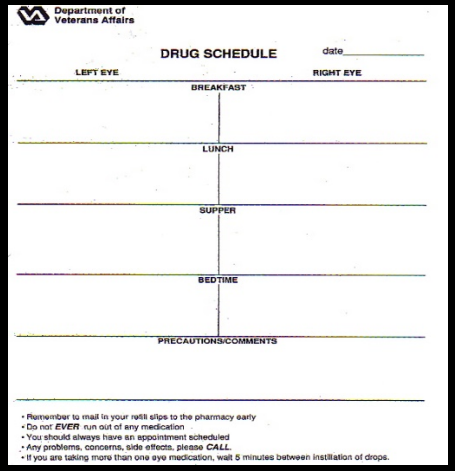
REASONS FOR NONADHERENCE

- FORGETFULNESS
- INCONVENIENCE
- DOSING FREQUENCY
- DIFFICULTY GETTING APPT
- NOT CONSIDERED SERIOUS
- WAITING TIME IN CLINIC
- INABILITY TO INSTILL DROPS
- SIDE EFFECTS OF MEDICATION
- CONFUSING INSTRUCTIONS
- COST OF THERAPY
- NO IMPROVEMENT OF SYMPTOMS
- LACK OF TRANSPORTATION
- RAN OUT OF MEDICATIONS
- FEAR
- LACK OF INSURANCE
- TOO MANY MEDICATIONS



IMPROVING ADHERENCE

- USE FEWEST DROPS NECESSARY
- REVIEW INSTILLATION
- TIMING SHOULD BE CONVENIENT FOR THE PATIENT
  - TIE THE DRUG TO A DAILY TASK
- COMMUNICATION
  - DISCUSS FINDINGS, RISK FACTORS, REASON FOR TREATMENT
  - DISCUSS SIDE-EFFECTS
  - REMIND OF IMPORTANCE OF COMING TO APPTS AND TAKING MEDICATION EVEN THOUGH NO CHANGE IN VISION OR HOW EYES FEEL
  - WILL BE LONG TERM, NOT ONE AND DONE BUT MANAGED / MONITORED FOR LIFE
- RECOMMEND MAIL ORDER
- ALARMS ON CELL PHONE, ETC.



Department of Veterans Affairs

DRUG SCHEDULE date_____

LEFT EYE		RIGHT EYE
	BREAKFAST	
	LUNCH	
	SUPPER	
	BEDTIME	
	PRECAUTIONS/COMMENTS	

- Remember to mail in your refill slips to the pharmacy early
- Do not *EVER* run out of any medication
- You should always have an appointment scheduled
- Any problems, concerns, side effects, please *CALL*
- If you are taking more than one eye medication, wait 5 minutes between instillation of drops.

Patient Name / Nombre:_____ Date / Fecha:_____

Latanoprost .005% (blue-green top / tapa azul verde)	☐Right Eye / Ojo Derecho ☐Left Eye / Ojo Izquierdo ☐Both Eyes / Ambos Ojos ☐Every Night / Cada Noche
Timolol 0.5% (yellow top / tapa amarillo)	☐Right Eye / Ojo Derecho ☐Left Eye / Ojo Izquierdo ☐Both Eyes / Ambos Ojos ☐Every Morning / Cada Manana ☐Every 12 Hours / Cada Doce Horas
Brimonidine 0.2% (purple top / tapa purpura)	☐Right Eye / Ojo Derecho ☐Left Eye / Ojo Izquierdo ☐Both Eyes / Ambos Ojos ☐Every 8 Hours / Cada Ocho Horas ☐Every 12 Hours / Cada Doce Horas
Dorzolamide 2% (orange top / tapa anaranjada)	☐Right Eye / Ojo Derecho ☐Left Eye / Ojo Izquierdo ☐Both Eyes / Ambos Ojos ☐Every 8 Hours / Cada Ocho Horas ☐Every 12 Hours / Cada Doce Horas
Dorzolamide 2% & Timolol 0.5% (dark blue top / tapa azul obscuro)	☐Right Eye / Ojo Derecho ☐Left Eye / Ojo Izquierdo ☐Both Eyes / Ambos Ojos ☐Every 12 Hours / Cada Doce Horas
Brinzolamide 1% & Brimonidine 0.2% (light green top / tapa verde claro)	☐Right Eye / Ojo Derecho ☐Left Eye / Ojo Izquierdo ☐Both Eyes / Ambos Ojos ☐Every 8 Hours / Cada Ocho Horas ☐Every 12 Hours / Cada Doce Horas

☐Shake Well / Agitar Bien

Should you have any questions about your eye medications, call telephone triage at 407-599-1404 or 1-800-645-8895.

Si usted tiene alguna pregunta acera de sus medicamentos para los ojos, llame triage telfonico al 407-599-1404 or 1-800-645-8895.

OrlandoVAMC PHEC APPROVED

TARGET IOP ADJUSTMENTS

- IF PATIENT IS ADHERERENT, BUT IOP STILL HIGH
  - ADJUST TREATMENT
  - CHECK FOR RESPONSE IN 4 WEEKS
- IF PROGRESSION AND IT HAS BEEN CONFIRMED
  - LOWER THE TARGET
  - ADJUST TREATMENT
  - CHECK FOR RESPONSE IN 4 WEEKS

WHAT IF NOT AT TARGET?

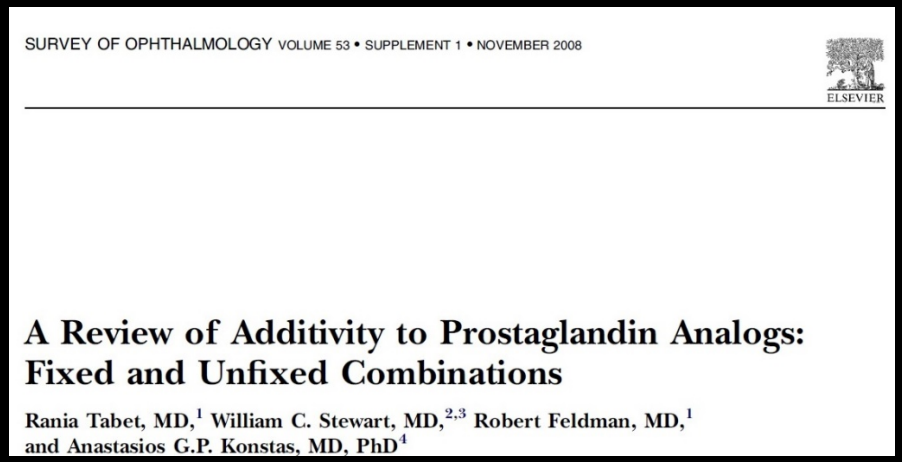
- DO NOT PANIC
  - OHTS
    - 39% OF PATIENTS NEEDED 2 MEDICATIONS TO ACHIEVE 20% REDUCTION
  - CIGTS
    - 50% OF PATIENTS NEEDED 2 MEDICATIONS TO ACHIEVE TARGET IOP
- OPTIONS
  - CHANGE WITHIN CLASS
  - CHANGE TO A DIFFERENT CLASS
    - CAI, BB, ALPHA-AGONIST, RHO-KINASE INHIBITOR
  - ADD A MEDICATION
    - SINGLE
    - COMBINATION
  - REFER FOR LASER
  - REFER FOR SURGERY
    - MIGS, TRAB, TUBE, ETC.
- STILL HAVE TO CONSIDER
  - PATIENT'S PREFERENCES
    - EVERYONE IS DIFFERENT
  - EFFICACY
    - MAGNITUDE OF IOP LOWERING
      - NEVER AS GOOD WHEN 2ND LINE
  - SIDE EFFECTS / TOLERABILITY
  - DOSING FREQUENCY / CONVENIENCE
  - COST

QUESTION

WHAT TO DO AFTER INITIAL PROSTAGLANDIN?

A. ADD CHOLINERGIC
B. ADD BETA-BLOCKER
C. ADD ALPHA-AGONIST
D. ADD CARBONIC ANYHDRASE INHIBITOR
E. CHANGE TO DIFFERENT PROSTAGLANDIN
F. ADD COMBINATION
G. ADD RHO-KINASE INHIBITOR
H. SEND FOR ALT / SLT
I. SEND FOR MIGS
J. SEND FOR TRAB / TUBE

PEOPLE WANT TO KNOW



SURVEY OF OPHTHALMOLOGY VOLUME 53 • SUPPLEMENT 1 • NOVEMBER 2008

ELSEVIER

A Review of Additivity to Prostaglandin Analogs: Fixed and Unfixed Combinations

Rania Tabet, MD,[1] William C. Stewart, MD,[2,3] Robert Feldman, MD,[1] and Anastasios G.P. Konstas, MD, PhD[4]

Volume 53 Supplement 1 November 2008

ASCRS FOR SURGEONS. FOR YOU.

EYEWORLD

CURRENT ISSUE PAST ISSUES EW WEEKLY EW ON SITE OPHTHALMOLOGY BUSINESS

EyeWorld - GLAUCOMA - After a prostaglandin, what's next?

EW Weekly

1. Use protection for mouth, nose, and eyes when treating potential coronavirus cases
2. Ocuphire enters agreement to in-license oral, small-molecule drug candidate for DR, DME
3. First single-cell analysis of uveal melanoma announced
4. DEXYCU to be developed, commercialized in mainland China and other countries

View EW Weekly Archives

I choose TECNIS® Personalized Vision for outstanding visual acuities.[1,2]
— Eric D. Donnenfeld, MD #EyeChooseTECNIS

FEBRUARY 2014

GLAUCOMA After a prostaglandin, what's next?

by Tony Realini, MD, MPH

What is the best adjunct when prostaglandin monotherapy isn't enough?

2014

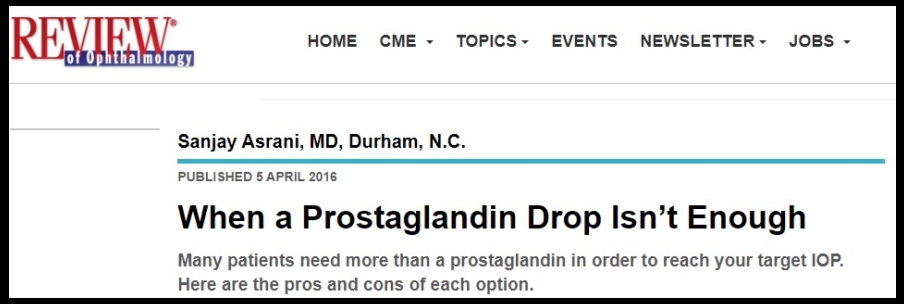
REVIEW

CURRENT OPINION

Medical therapy for glaucoma: what to add after a prostaglandin analogs?

Angelo P. Tanna and Albert B. Lin

Volume 26 Number 2 March 2015



REVIEW of Ophthalmology

HOME CME TOPICS EVENTS NEWSLETTER JOBS

Sanjay Asrani, MD, Durham, N.C.

PUBLISHED 5 APRIL 2016

When a Prostaglandin Drop Isn't Enough

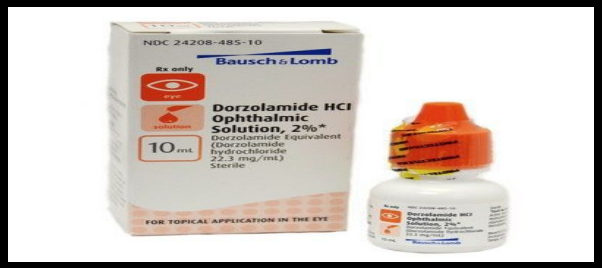
Many patients need more than a prostaglandin in order to reach your target IOP. Here are the pros and cons of each option.

2016

TRADITIONAL OPTIONS

TRADITIONAL OPTION "HIGHLIGHTS"

- MECHANISM
  - REDUCES AQUEOUS PRODUCTION
- EFFICACY
  - 19-29% IOP REDUCTION
- DOSING
  - QD OR Q12H
- OCULAR SIDE EFFECTS
  - >10% BURNING, STINGING
- SYSTEMIC SIDE EFFECTS
  - BRADYCARDIA, SHORTNESS OF BREATH, DROWSINESS, DECREASED LIBIDO
- CONTRAINDICATIONS
  - ASTHMA, COPD, BRADYCARDIA, CHF, HIGH CHOLESTEROL

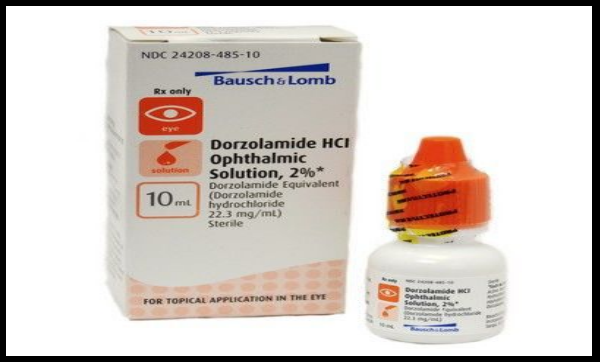


- MECHANISM
  - REDUCES AQUEOUS PRODUCTION
- EFFICACY
  - UP TO 24% IOP REDUCTION AFTER 2 HOURS
- DOSING
  - Q12H OR Q8H
- OCULAR SIDE EFFECTS
  - >10% BURNING, SPK DISCOMFORT, STINGING
- SYSTEMIC SIDE EFFECTS
  - SKIN RASH, BITTER TASTE, FATIGUE
- CONTRAINDICATIONS
  - SULFA ALLERGIES

- MECHANISM
  - REDUCES AQUEOUS PRODUCTION
  - MAY INCREASE UVEOSCLERAL OUTFLOW
  - REDUCES EVP
- EFFICACY
  - 20-25% IOP REDUCTION AFTER 2 HOURS
- DOSING
  - Q12H OUR Q8H
- OCULAR SIDE EFFECTS
  - >10% ALLERGIC CONJUNCTIVITIS, HYPEREMIA
- SYSTEMIC SIDE EFFECTS
  - >10% DROWSINESS
- CONTRAINDICATIONS
  - MAO INHIBITORS

PGA + TRADITIONAL OPTIONS

IOP AND SIDE EFFECT COMPARISON



SYTEMATIC REVIEWS / META-ANALYSIS OF

PROSTAGLANDIN + BB or CAI or AA

- IOP
  - SIMILAR IOP REDUCTION
  - ~ 15% or 2.3-3 mmHg

- SIDE EFFECTS
  - EYE PAIN / BURNING
    - AA > BB, CAI > BB
  - FATIGUE / WEAKNESS
    - AA > CAI, BB > CAI
  - TASTE DISTURBANCE
    - CAI > AA, CAI > BB
  - DRY MOUTH
    - AA > CAI, AA > BB

I SUGGEST…
PROSTAGLANDIN + BETA-BLOCKER

- IF NO CONTRAINDICATIONS
  - NO COPD
  - NO BRADYCARDIA (WANT PULSE > 60 BPM)
  - DEBATABLE BENEFIT IF ALREADY ON A SYSTEMIC BB
- WHY?
  - CONVENIENT DOSING
    - PROSTAGLANDIN AT NIGHT
    - TIMOLOL 0.5 QAM OU
- CAUTION IF NORMAL TENSION GLAUCOMA
  - THERE IS A VASCULAR COMPONENT TO GLAUCOMA
    - BETA-BLOCKERS MAY REDUCE OPTIC NERVE PERFUSION

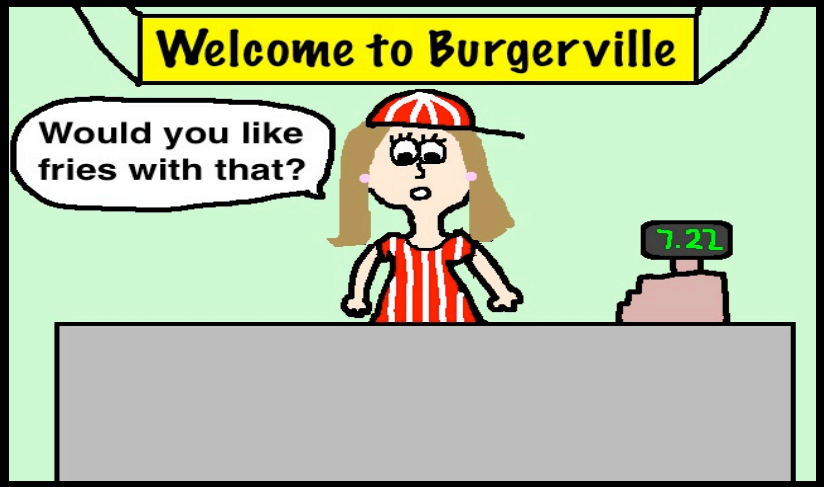
QUESTION

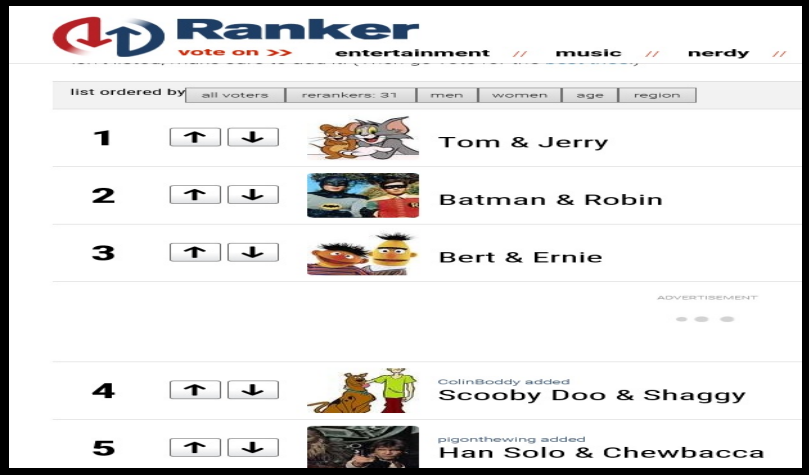
YOUR PATIENT IS STILL NOT AT TARGET.

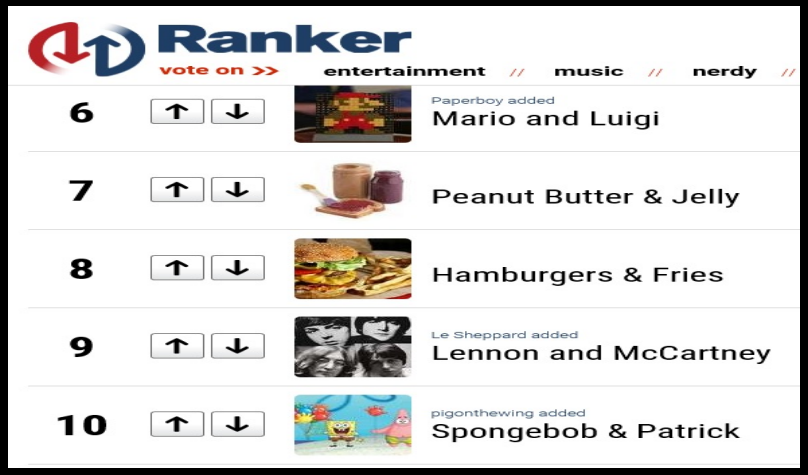
YOU HAVE THE PATIENT ON 2 MEDS (2 BOTTLES) WHAT DO YOU DO NEXT?

A. ADD ANOTHER MEDICATION (3RD BOTTLE)
B. CHANGE ONE MED TO A COMBINATION (2 BOTTLES)
C. SEND FOR ALT / SLT
D. SEND FOR MIGS
E. SEND FOR TRAB / TUBE

CONSIDER COMBOS





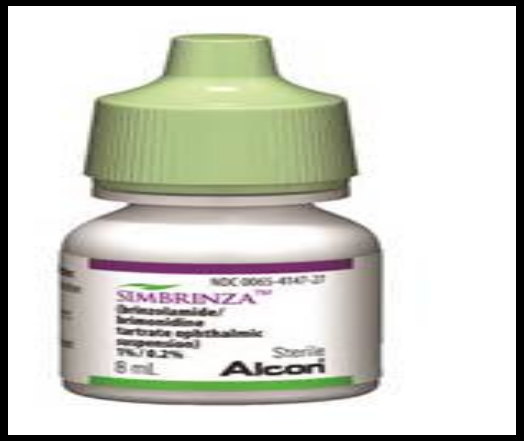


DEPENDING ON WHAT YOU ADDED 2ND…

TRADITIONAL COMBINATION OPTIONS

- DORZOLAMIDE / TIMOLOL
- BOTH REDUCE AQUEOUS PRODUCTION
- GENERIC AVAILABLE
- DOSING
  - q12h

- BRIMONIDINE / TIMOLOL
- BOTH REDUCED AQUEOUS BRIM MAY HELP WITH UVEOSCLERAL OUTFLOW
- DOSING
  - q12h



- BRINZOLAMIDE / BRIMONIDINE
- BOTH REDUCE AQUEOUS PRODUCTION, BRIM MAY HELP WITH UVEOSCLERAL OUTFLOW
- SUSPENSION
  - SHAKE WELL
- DOSING
  - q12h or q8h

COMBINATION PROS and CONS

- PROS
  - 1 BOTTLE, 2 MEDS, MAY IMPROVE ADHERENCE
  - MAY DECREASE OCULAR SURFACE DISEASE
- CONS
  - COST?
    - PER GOODRX SEARCH 11/19/21
      - DORZOLAMIDE TIMOLOL $16-27
      - SIMBRINZA $187-200
      - COMBIGAN $200-213
- QUESTION
  - COULD YOU SKIP THE INDIVIDUAL INGREDIENTS AND GO RIGHT TO A COMBO AS 2ND LINE?
  - ANSWER
    - MAYBE, LATELY I HAVE BEEN CHOOSING THIS METHOD
    - HOWEVER
      - WHICH INGREDIENT IS WORKING?
      - WHICH INGREDIENT CAUSED SIDE EFFECT?

IF NO OR MINIMAL RESPONSE TO TRADITIONAL COMBINATION…

- MAKE SURE PATIENT IS ADHERENT
  - IF GOOD ADHERENCE, IT IS NOT EFFECTIVE
    - SWAP FOR ANOTHER TRADITIONAL COMBINATION

    OR
    - SWAP YOUR CHOSEN PROSTAGLANDIN FOR NEWER OPTION
      - VYZULTA
      - OR
      - ROCKLATAN (COMBINATION)

  - IF FOLLOWING ALONG…
    - PT IS STILL ONLY USING 2 BOTTLES

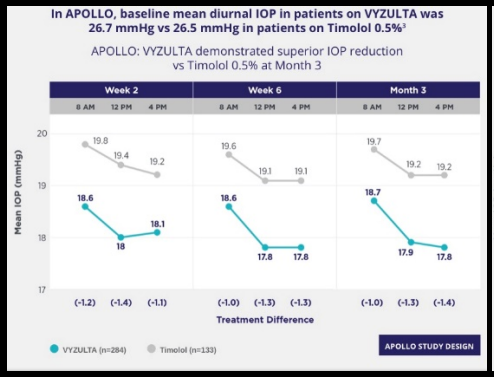
THE "NEW" OPTIONS

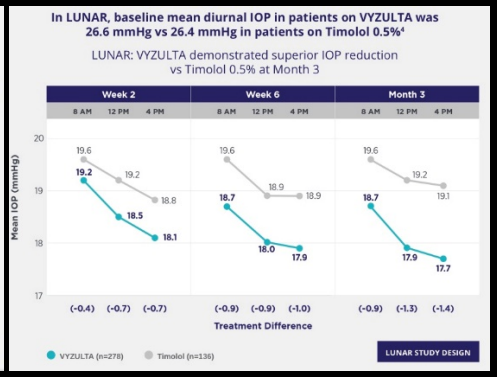
VYZULTA

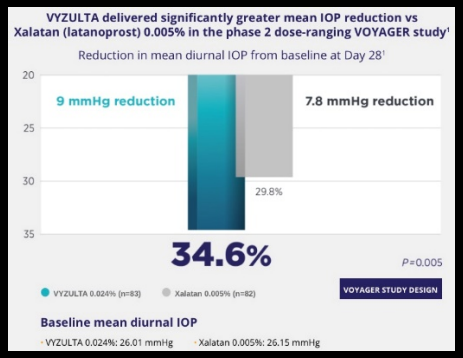
- LATANOPROSTENE BUNOD 0.24%
  - BAUSCH AND LOMB
  - FDA APPROVED 2017
- MECHANISM
  - METABOLIZED INTO LATANOPROST AND NITRIC OXIDE
  - LOWERS IOP
    - LATANOPROST
      - UVEOSCLERAL (NONCONVENTIONAL)
    - NITRIC OXIDE
      - RELAXATION OF TM AND SCHLEMM'S CANAL (CONVENTIONAL)
  - VASCULAR EFFECT
    - NITRIC OXIDE MAY ALSO INCREASE OPTIC NERVE BLOOD FLOW
- DOSING
  - QHS
  - ONSET 1-3 HOURS
  - PEAK EFFECT 11-13 HOURS

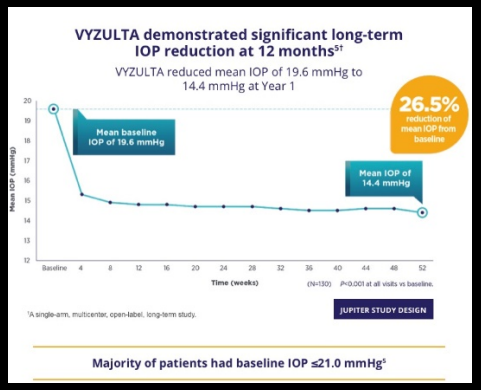
VYZULTA EFFICACY

- STUDIES ON EFFICACY
  - APOLLO AND LUNAR
    - COMPARED TO TIMOLOL
  - VOYAGER
    - COMPARED TO XALATAN
  - MERCURY
    - NTG PATIENTS









VYZULTA

- OCULAR SIDE EFFECTS
  - SAME AS OTHER PROSTAGLANDINS
  - 1-10%
    - LOCAL APPLICATION SITE PAIN
    - CONJUNCTIVAL HYPEREMIA, EYE IRRITATION, EYE PAIN
- SYSTEMIC SIDE EFFECTS
  - SAME AS OTHER PROSTAGLANDINS
- CONTRAINDICATIONS / WARNINGS / PRECAUTIONS
  - SAME AS OTHER PROSTAGLANDINS

In APOLLO and LUNAR: 6 out of 811 patients treated with VYZULTA discontinued treatment due to ocular adverse events[3,4,6]

Less than 1% discontinued due to ocular adverse reactions[6]

- 0.6% of patients discontinued therapy due to ocular adverse events, including hyperemia, conjunctival irritation, eye irritation, eye pain, conjunctival edema, vision blurred, punctate keratitis, and foreign body sensation

Most common adverse reactions[3,7‡]

Adverse Reactions	VYZULTA (n=811)	Timolol 0.5% (n=271)
Conjunctival Hyperemia	**5.9%**	1.1%
Eye Irritation	**4.6%**	2.6%
Eye Pain	**3.6%**	2.2%
Ocular Hyperemia	**2.0%**	0.7%
Instillation Site Pain	**2.0%**	1.8%

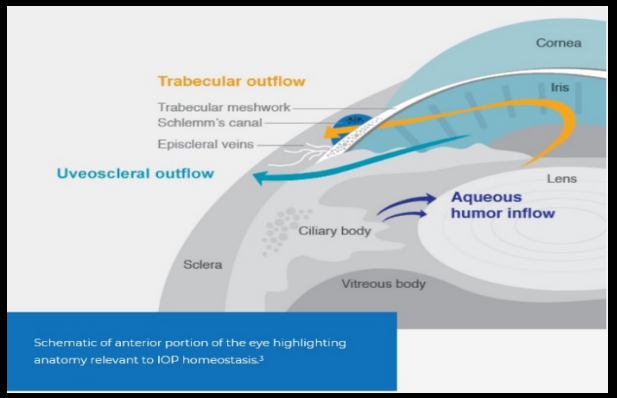
‡Pooled results from the APOLLO and LUNAR studies: ocular adverse reactions occurring in ≥2% of study eyes.[3,7]

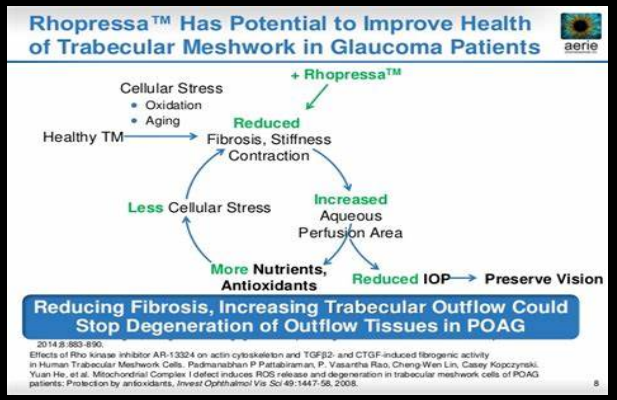
RHO-KINASE INHIBITORS

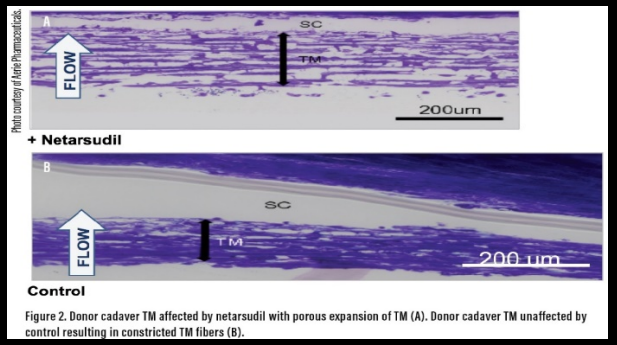
- OPTION
  - RHOPRESSA (AERIE)
- MECHANISM
  - EXACT MECHANISM UNKNOWN
- DOSING
  - QHS

RHO-KINASE INHIBITORS

- MECHANISM
  - THEORIES
    - MODULATES CONVENTIONAL AQUEOUS OUTFLOW ROUTE THROUGH THE TRABECULAR MESHWORK
      - INHIBITS ROCK SIGNALLING PATHWAY THAT PROMOTES CELL CONTRACTILITY AND ADHESION OF FIBROBLAST CELLS
      - INDUCES RELAXATION AND REDUCED FOCAL ADHESIONS
    - MAY REDUCE AQUEOUS PRODUCTION
    - MAY DECREASE EPISCLERAL VENOUS PRESSURE

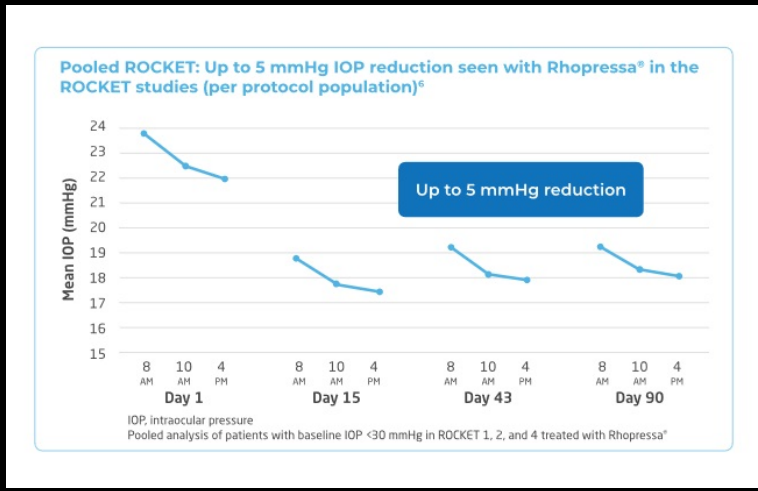


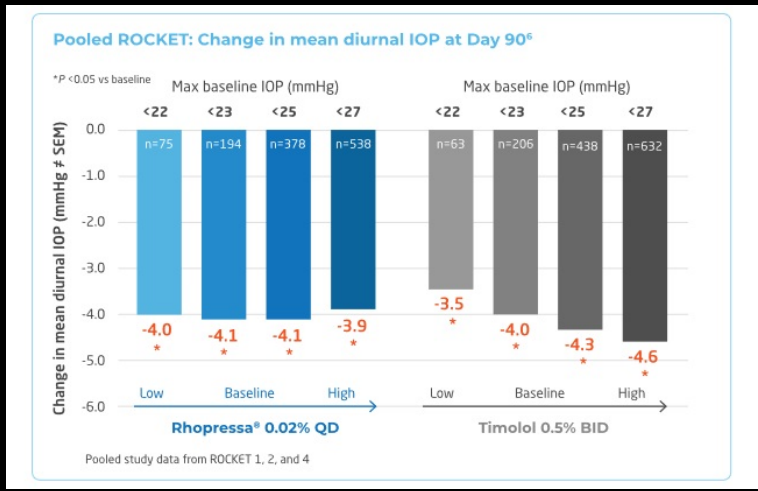




RHOPRESSA

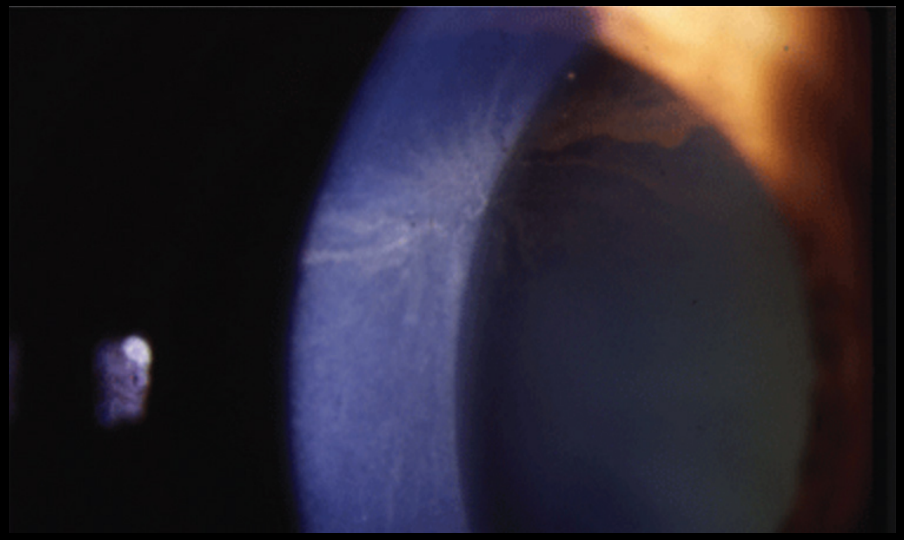
- EFFICACY
  - 15-22% REDUCTION OF IOP
  - MULTIPLE STUDIES DONE
    - 5 mmHg IOP REDUCTION
    - SIMILAR TO TIMOLOL WHEN BASELINE IOP < 25 mmHg
    - NOT AS EFFECTIVE WITH IOP > 27 mmHg (TIMOLOL WAS BETTER)





RHOPRESSA

- OCULAR SIDE EFFECTS
  - >10%
    - CONJUNCTIVAL HYPEREMIA (53%)
    - SITE PAIN (20%)
    - CONJ HEMORRHAGE (20%)
    - CORNEAL DEPOSITS / VERTICILLATA (20%)
      - SHOWED UP AT 4 WEEKS, NO IMPACT ON VISION, RESOLVED UPON DISCONTINUATION
  - 1-10%
    - ERYTHEMA OF EYELID
    - BLURRED VISION, CORNEAL STAINING, DECREASED VISUAL ACUITY, LACRIMATION
- SYSTEMIC SIDE EFFECTS
  - NONE
- CONTRAINDICATIONS
  - NONE



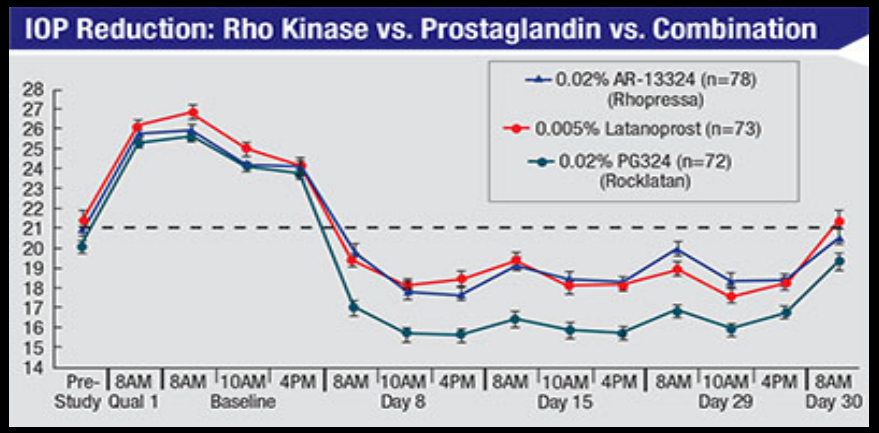
https://reviewofcontactlenses.com/article/rock-and-whorl

RHO KINASE INHIBITOR + PROSTAGLANDIN

- OPTIONS
  - ROCKLATAN (3/13/19)
    - NETARSUDIL 0.02% AND LATANOPROST 0.005%
    - AERIE PHARMACEUTICALS

RHO KINASE INHIBITOR + PROSTAGLANDIN

- MECHANISM
  - SAME AS COMPONENTS
- EFFICACY
  - MERCURY 1 AND 2 TRIALS
    - COMPARED TO LATANOPROST
    - COMPARED TO RHOPRESSA
- DOSING
  - QHS
- OCULAR SIDE EFFECTS
  - SAME AS COMPONENTS
- SYSTEMIC SIDE EFFECTS
  - SAME AS COMPONENTS
- CONTRAINDICATIONS
  - SAME AS COMPONENTS



REVIEW OF OPHTHALMOLOGY ONLINE 06/05/16

IOP

In the MERCURY-1 trial, conducted to support the approval of Rocklatan® (netarsudil and latanoprost opthalmic solution) 0.02%/0.005%, Rhopressa® further demonstrated mean **IOP reduction up to 6.1 mmHg**[6]

- Phase 3 studies, MERCURY-1 and MERCURY-2 both included a wide range of baseline IOPs (>17 to <36 mmHg) vs ROCKET trials[9,10]

MY PROBLEM WITH THE "NEW" OPTIONS (CURRENTLY)

- COST IS AN ISSUE (AS OF 11/11/21)
  - VYZULTA 0.024% $219-234
  - RHOPRESSA $286-305
  - ROCKLATAN $303-322

- FYI
  - AT THE VA WE HAVE TO TRY ALL CLASSES OF MEDS PRIOR TO USING ANY OF THE "NEW" OPTIONS
  - HOWEVER, THEY WILL BE CONSIDERED/APPROVED IF
    - DOCUMENTED SIDE EFFECTS
    - FAILURE TO ACHIEVE TARGET IOP
    - PATIENT STILL PROGRESSING

MY SUGGESTION FOR RAMPING UP TOPICAL TREATMENT

- MAXIMUM MEDICAL THERAPY
  - 1ST LINE (1 BOTTLE)
    - PROSTAGLANDIN
  - 2ND LINE (2 BOTTLES)
    - ADD GENERIC TIMOLOL OR DORZOLAMIDE OR BRIMONIDINE
  - 3RD LINE (2 BOTTLES)
    - CHANGE TO COMBINATION
      - GENERIC COSOPT OR SIMBRINZA OR COMBIGAN
  - 4TH LINE (2 BOTTLES)
    - CHANGE PROSTAGLANDIN TO
      - VYZULTA OR ROCKLATAN

PROBLEMS WITH LONG TERM MEDICAL THERAPY

- POOR ADHERENCE WITH MEDICATION USAGE
- SIDE EFFECTS FROM GLAUCOMA MEDICATIONS
- WIDE FLUCTUATIONS IN IOP DUE TO
  - TROUGH EFFECTS
  - NOT USING MEDICATION AT APPROPRIATE TIMES
- REDUCED PROGNOSIS OF GLAUCOMA SURGERY DUE TO OCULAR SURFACE DISEASE

TOXICITY OF TOPICALS

- OCULAR SURFACE DISEASE
  - REDNESS, TEARING, IRRITATION, BURNING, FOREIGN BODY SENSATION, LIGHT SENSITIVITY, INTERMITTENT BLURRED VISION
  - MECHANISM IS UNKNOWN
    - CONJUNCTIVAL HYPEREMIA
    - CELLULAR APOPTOSIS
    - INFLAMMATORY CELL INFILTRATION OF CONJUNCTIVA
- 15% OF ELDERLY PATIENTS
- UP TO 60% OF GLAUCOMA PATIENTS
- IMPACT
  - QUALITY OF LIFE
  - MAY REDUCE FUTURE SUCCESS OF GLAUCOMA SURGERY

MEDICATION SIDE EFFECTS

- CIGTS
  - MEDICINE VS SURGERY
  - 607 PATIENTS, 29-75 YRS, 55% MALE, 38% BLACK
  - QOL TEST(S): VAQ, SIP
    - > 25% REPORTED
      - IRRITATION
      - BURNING
      - PAIN
      - REDNESS

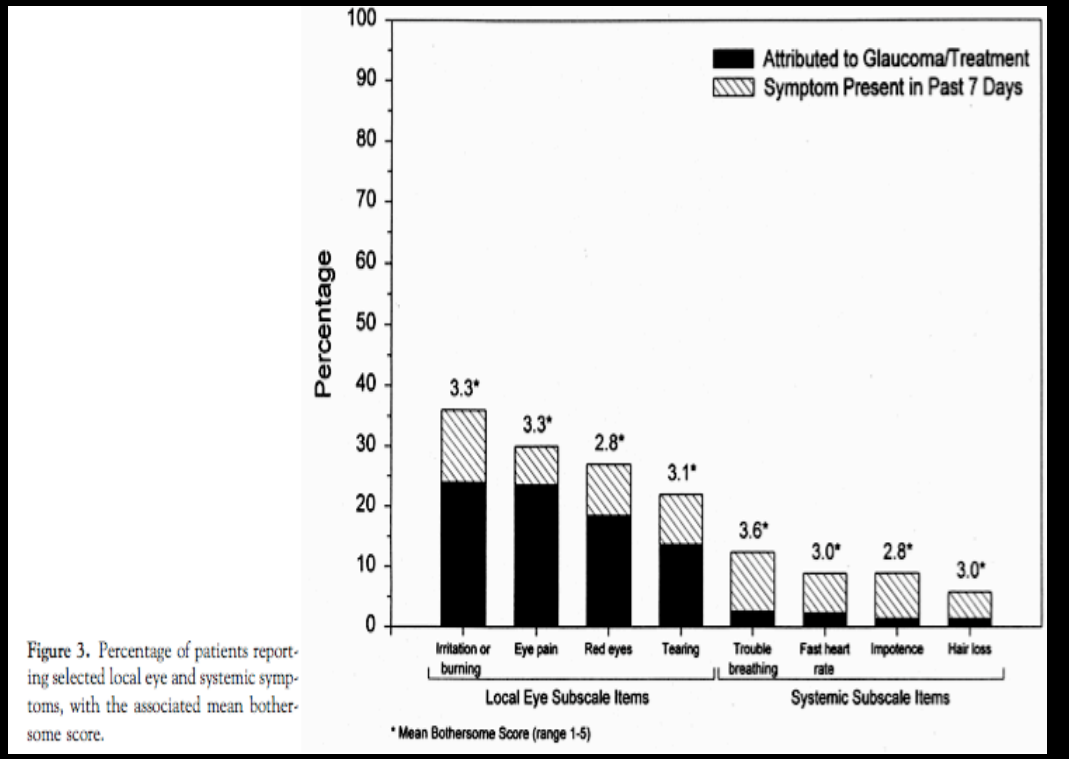
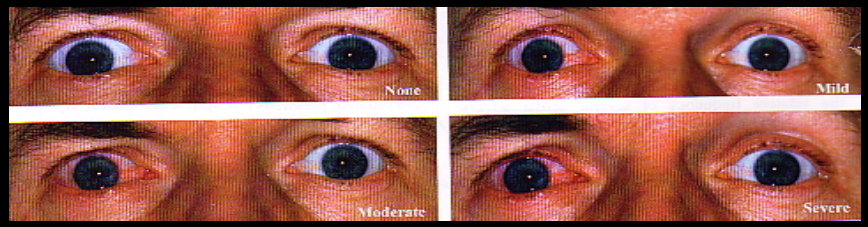
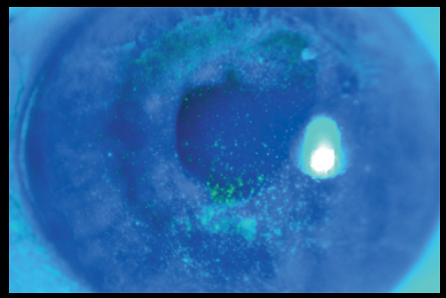


Figure 3. Percentage of patients reporting selected local eye and systemic symptoms, with the associated mean bothersome score.





PRESERVATIVE FREE OPTIONS

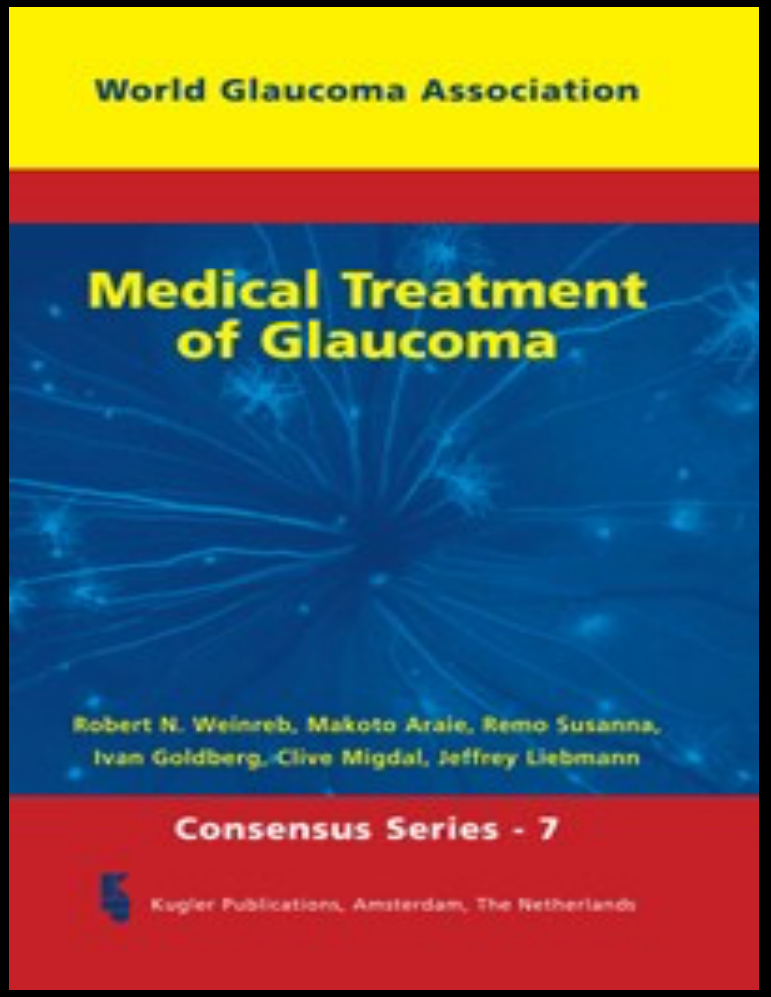
- PROS
  - LESS IRRITATION, LESS DISCOMFORT
  - HEALTHIER OCULAR SURFACE
  - MAY PRESERVE THE CONJUNCTIVA FOR TRAB / TUBE SUCCESS
- CONS
  - COST
- WHAT'S AVAILABLE?
  - PROSTAGLANDINS
    - TRAVATAN Z
      - TRAVATAN 0.004% (BAK FREE)
    - XELPROS
      - LATANOPROST 0.005% (BAK FREE)
    - ZIOPTAN
      - TAFLUPROST 0.0015% (PRESERVATIVE FREE)
  - OTHERS
    - PF TIMOLOL
    - PF COSOPT

WHEN SHOULD AN OPTOMETRIST REFER?

- MULTIPLE MEDICATIONS HAVE BEEN TRIED AND…
  - IF PATIENT IS ADHERENT
    - TARGET IOP HAS NOT BEEN REACHED
    - PATIENT IS PROGRESSING
  - IF PATIENT IS NONADHERENT
- THE PATIENT WOULD LIKE ANOTHER OPINION
- WHEN THE OPTOMETRIST IS NO LONGER COMFORTABLE

WGA CONSENSUS STATEMENTS

- INITIAL RESPONSE SHOULD BE AT LEAST 20% BELOW BASELINE
  - SWITCHING WITHIN CLASS IS OPTION
    - 2 DRUGS IN SAME CLASS NOT RECOMMENDED
- 2ND DRUG OR LASER
  - WHEN NOT AT TARGET
  - 2ND DRUG EFFICACY NOT AS GOOD
    - 2 DRUGS IN SAME CLASS NOT RECOMMENDED
- COMBINATIONS
  - AS EFFICACIOUS AS INDEPENDENT AGENTS USED TOGETHER
    - CONVENIENT
    - LESS PRESERVATIVES
    - POSSIBLE BETTER ADHERENCE
- SURGERY
  - USED WHEN MEDICINE OR LASER
    - FAILS TO REACH TARGET
    - ALLERGY
    - INTOLERANCE
    - POOR ADHERENCE
    - LACK OF AVAILABILITY
    - PATIENT STILL PROGRESSING



MAY 1, 2010

https://wga.one/wga/consensus-7/

GLAUCOMA SURGERY

- PURPOSE
  - FOR ADDITIONAL IOP REDUCTION DESPITE MAXIMUM TOLERATED MEDICAL THERAPY AND LASER
- MECHANISM
  - INCREASE AQUEOUS OUTFLOW
  - DECREASE AQUEOUS PRODUCTION

WHAT MIGHT THE SURGEON DO?

- MONITORING
  - BELIEVE IT OR NOT
    - YOU MAY ACTUALLY BE DOING A GOOD JOB
  - ADDITIONAL DATA COLLECTION (VF, OCT)
  - SURGEON AND PATIENT MAY OPT AGAINST SURGERY
- ALT/SLT
  - IF NOT ALREADY DONE
- SURGERY
  - MIGS
  - INCISIONAL SURGERY
  - OTHER

MIGS

MICROINVASIVE OR MINIMALLY INVASIVE GLAUCOMA SURGERY

- FROM THE AGS
  - REDUCES IOP BY IMPROVING OUTFLOW
  - APPROACHED FROM INSIDE OR OUTSIDE
  - LIMITED MANIPULATION OF SCLERA OR CONJUNCTIVA
  - DOES NOT PRECLUDE POSSIBILITY OF TRADITIONAL SURGERY
- BENEFITS
  - HIGHER SAFETY PROFILE VS TRABECULECTOMY
  - SHORTER SURGERY TIME
  - EASE OF USE
  - FEWER COMPLICATIONS
  - FASTER RECOVERY TIME
  - DECREASE IOP AND/OR PATIENT'S NEED FOR MEDICATION

MIGS

- WHO IS A CANDIDATE?
  - MILD-MODERATE OAG
  - PXF GLAUCOMA
  - PIGMENTARY GLAUCOMA
  - UNCONTROLLED GLAUCOMA ON MAXIMUM TREATMENT OR BARRIERS TO PREVENT ADEQUATE DOSING
  - >18
  - CATARACT?
- CONTRAINDICATIONS
  - ANGLE CLOSURE
  - MODERATE-ADVANCED SECONDARY GLAUCOMA
  - SEVERELY UNCONTROLLED GLAUCOMA
  - PREVIOUS GLAUCOMA SURGERY
  - PREVIOUS REFRACTIVE PROCEDURES
  - MONOCULAR PATIENTS

CURRENT MIGS OPTIONS

- CAUTERY DEVICE
  - TRABECTOME
- CANAL BASED STENTING
  - iSTENT
  - HYDRUS
- VISCODILATION
  - OMNI
  - ABiC (CANALOPLASTY)
- EXCISIONAL GONIOTOMY
  - KAHOOK DUAL BLADE
- RECALLED
  - CYPASS 8/18
  - XEN 10/19
    - ONLY CERTAIN LOTS RECALLED
    - IS STILL BEING USED

https://eyewiki.aao.org/Microinvasive_Glaucoma_Surgery_(MIGS)
https://www.reviewofophthalmology.com/article/migs-a-look-at-the-latest-results

COMMENTS ON MIGS

- FROM THE EXPERTS
  - MILD EFFICACY
  - NOT USED TO GET TO VERY LOW IOP
  - CONSIDER FOR IOP IN MID 20s NOT CONTROLLED ON 2 MEDS
  - FOR MILD TO MODERATE GLAUCOMA
  - TRADITIONAL SURGERY STILL FOR ADVANCED GLAUCOMA

Pearls From the Experts

DR. CAPRIOLI: "For patients who have optic nerve damage and visual fields that are getting worse, the mild efficacy achieved with MIGS is not, in the majority of cases, the answer."

DR. FRANCIS: "You want to pick patients who require pressure lowering, but not to an extremely low level, and for whom you want to reduce the number of medications. For a standalone procedure [without cataract surgery], my typical patient is somebody who has a high IOP, generally in the 20s, and is uncontrolled on generally two or more medications."

DR. GEDDE: "Consideration may be given to MIGS in combination with cataract surgery in patients with mild to moderate glaucoma, especially if they're having difficulty with medical therapy. Traditional glaucoma surgery is generally preferred in patients with advanced glaucoma or progressive disease in which low levels of IOP are needed."

http://www.aao.org/eyenet/article/two-approaches-to-migs-istent--trabectome

- WHAT'S NOT KNOWN?
  - LONGTERM SAFETY OR EFFECTIVENESS DATA

MORE ON MIGS

- 20 TRIALS REVIEWED
- 3476 EYES, MEAN AGE 69.5
- 53.7% FEMALE, 77.4% CAUCASIAN
- SUMMARY
  - THERE IS SOME EVIDENCE TO SUPPORT THE ROLE OF MIGS DEVICES IN THE CURRENT TREATMENT ARMAMENTARIUM FOR GLAUCOMA WITH A GOAL OF MODEST IOP AND TOPICAL MEDICATION REDUCTION
  - STUDIES SUFFER FROM
    - BIAS, CONFLICT OF INTEREST, INDUSTRY SPONSORHIP, LACK OF STANDARDIZED REPORTING
  - PROSPECTIVE RANDOMIZED MASKED TRIALS AND COST EFFECTIVESS STUDIES NEED TO BE DONE

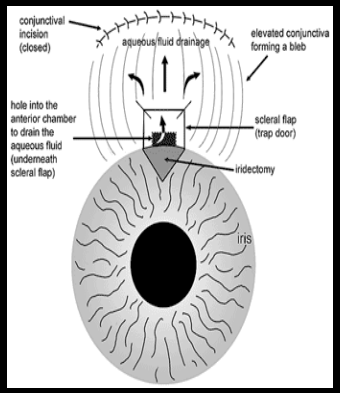
Survey of Ophthalmology 66 (2021) 714-742

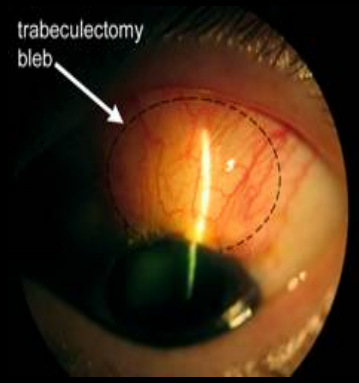
INCISIONAL SURGERY

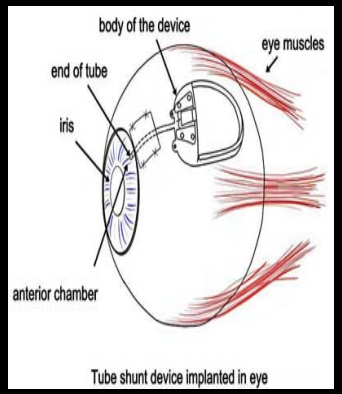
- FOR
  - PATIENT PRESENTING WITH SEVERE DAMAGE (BASED ON OPTIC NERVE, NERVE FIBER LAYER, VISUAL FIELD)
  - PATIENT WHO IS YOUNG
  - PATIENT WHO IS AFRICAN AMERICAN
  - PATIENT WHO IS AN IOP SPIKER
  - PATIENT WITH A THINNER CORNEA
  - PATIENT WITH A FAMILY MEMBER (SIBLING) WHO IS BLIND FROM GLAUCOMA
  - PATIENT WHO IS BLIND IN ONE EYE FROM GLAUCOMA
  - PATIENT WHO IS NON-COMPLIANT
  - PATIENT WITH PROGRESSION DESPITE TREATMENT

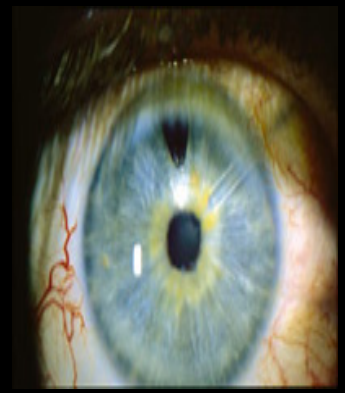
INCISIONAL SURGERY OPTIONS

- TRABECULECTOMY
  - FIRST DESCRIBED IN 1968
  - MECHANISM
    - CREATES A DRAINAGE CHANNEL (A HOLE IN THE EYE)FROM THE ANTERIOR CHAMBER TO EXTERNAL SURFACE OF THE EYE UNDER THE CONJUNCTIVA
    - AQUEOUS SEEPS INTO BLEB WHICH IS SLOWLY ABSORBED
  - WITH MMC TO PREVENT SCARRING
- TUBE / SHUNT (GLAUCOMA DRAINAGE DEVICE)
  - MECHANISM
    - PLACEMENT OF TUBE / VALVE TO FACILITATE AQUEOUS OUTFLOW
- TYPES
  - LITTLE RESISTANCE TO AQUEOUS (BAERVELDT, MOLTENO)
  - UNIDIRECTIONAL VALVE (AHMED, KRUPIN)







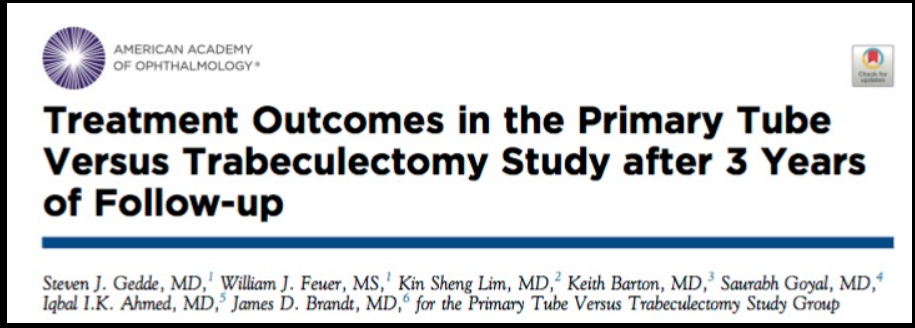


TUBE vs TRAB (TVT) STUDY

- PROSPECTIVE STUDY (17 CENTERS, 212 EYES OF 212 PATIENTS)
  - 107 IN TUBE GROUP, 105 IN TRAB / MMC GROUP
  - PATIENTS
    - UNCONTROLLED GLAUCOMA, S/P CE/IOL AND / OR FAILED TRAB
  - 5 YEAR RESULTS (GEDDE SJ, ET AL. MARCH 3, 2011 AGS MEETING, CALIFORNIA)
    - IOP: 14.2 +/- 6.3mmHg TUBE VS 12.8 +/- 5.8 mmHg TRAB
    - PROBABILITY OF FAILURE: 26% TUBE VS 45% TRAB (P = 0.002)
    - LATE COMPLICATIONS: 34% TUBE VS 37% TRAB (P = .67)
    - ENDOPHTHALMITIS / BLEBITIS: TUBE 0 VS TRAB 4.8%
    - CONCLUSIONS
      - TUBE SHUNTS ARE A GOOD ALTERNATIVE IN THOSE WHO HAVE HAD PRIOR SURGERY
      - TOTAL COSTS OF TUBE WERE HIGHER THAN TRAB
- WAS NOT A STUDY ON “FRESH” PATIENTS

PRIMARY TRAB VS TUBE (PTVT)

- 242 EYES
  - MEDICALLY UNCONTROLLED GLAUCOMA
  - NO PRIOR INCISION SURGERY
  - 125 TUBE, 117 TRAB
- 3 YEAR DATA
  - PROBABILITY OF FAILURE
    - 33% TUBE
    - 28% TRAB
  - SERIOUS COMPLICATIONS
    - 2% TUBE
    - 8% TRAB
  - IOP / MEDS
    - TUBE 14.0 / 2.1
    - TRAB WITH MMC 12.1 / 1.2



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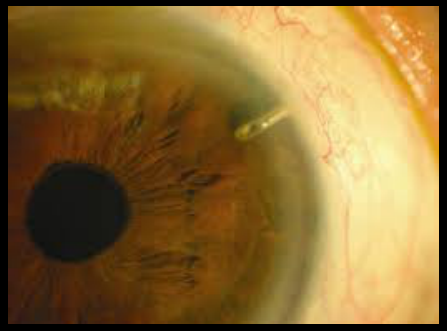
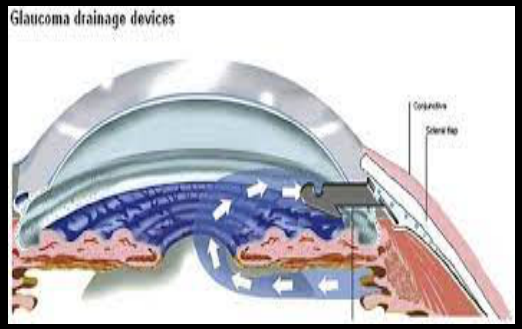
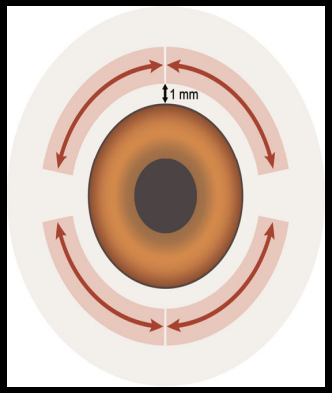
A FEW OTHER OPTIONS YOU MAY SEE BEING DONE

- MINI-EXPRESS SHUNT
  - FROM NOVARTIS / ALLERGAN
  - FDA APPROVED 2003
  - MECH: INCREASE IN OUTFLOW
  - DESIGNED TO IMPROVE BEYOND A TRABECULECTOMY
    - NO SCLEROSTOMY OR IRIDECTOMY
    - BLEB IS FORMED
  - RESULTS (100,000 PTS AS OF 2016)
    - SIMILAR IOP TO TRAB ALONE
    - LESS RISK OF HYPOTONY / HYPHEMA
  - COST OF DEVICE IS AN ISSUE





- MICROPULSE TRANSSCLERAL CYCLOPHOTOCOAGULATION (CPC)
  - FDA APPROVED 2015
  - MECH: REDUCES AQUEOUS PRODUCTION
  - REPETITIVE SHORTS PULSES WITH REST PERIODS = LESS COLLATERAL DAMAGE
  - DONE EARLIER THAN TRADITIONAL CYCLO
  - RESULTS (LIMITED STUDIES)
    - 50% RECEIVED 30% IOP LOWERING. LESS MEDS
    - SIDE EFFECTS: PAIN, INFLAMMATION, IOP SPIKE, CORNEAL EDEMA
  - CAN BE REPEATED



IF REFERRING…

- SEND REFERRAL LETTER
  - NOT HANDWRITTEN
  - NOT ON A RX PAD
- 2014 SURVEY
  - 135 GLAUCOMA SPECIALISTS
  - 200 REFERRAL LETTERS
    - WHAT DID GLAUCOMA SPECIALISTS WANT TO SEE?
      - MAXIMUM IOP
      - CURRENT IOP
      - DISC EVAL
      - VF RESULTS
      - DISC IMAGING
    - OPTOMETRISTS DID BETTER THAN OPHTHALMOLOGISTS IN TERMS OF LEGIBILITY AND DATA INCLUDED
    - CONSIDER USING A TEMPLATE

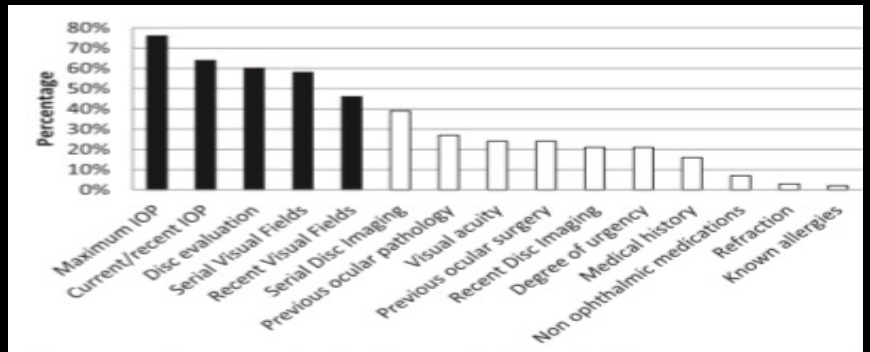


Figure 3. Survey results for the top 5 clinical information items to be included in a referral letter for the diagnosis of glaucoma. The top 5 answers are in *black*, and the remaining are in *white*. IOP = intraocular pressure.

DIAGNOSIS

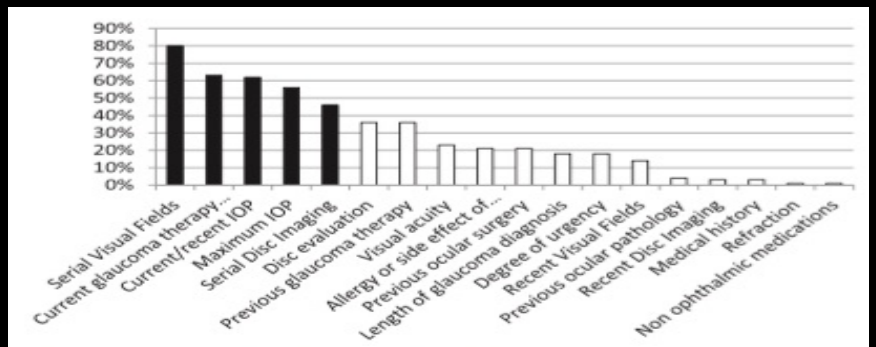


Figure 4. Survey results for the top 5 information items to be included in a referral letter for unstable glaucoma (progression or surgery). The top 5 answers are in *black*, and the remaining are in *white*. IOP = intraocular pressure.

PROGRESSION

FINALLY

- SUSPECT EVERYONE
- ODS SHOULD MANAGE GLAUCOMA
- IF YOU HAVE THE PATIENTS (AND THE PATIENCE), EQUIPMENT, MOTIVATION…
  - YOU HAVE BEEN TRAINED TO DO THIS
  - FOLLOW THE 5 BASIC STEPS
- MANAGE TO YOUR / PATIENT'S COMFORT / CONFIDENCE LEVEL
- REFER TO OD COLLEAGUE OR GLAUCOMA SPECIALIST AS NECESSARY
  - TESTING OR INTERVENTION YOU CANNOT DO
  - GET THEM BACK (IF WANTED)
    - CO-MANAGE
    - MONITOR FOR CHANGE

There are five basic steps to follow in managing a patient with glaucoma:

1. Establish a good baseline.
2. Set a reasonable target for intraocular pressure (IOP).
3. Lower the pressure.
4. Follow up with the patient to see if the target pressure is maintained and if the glaucomatous damage progresses.
5. Modify the target pressure and treatment as indicated by the patient's course.