HOT TOPICS IN GLAUCOMA

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1

DISCLOSURE SLIDE FOR ERIC SCHMIDT

- Dr Schmidt is an advisor or consultant for the following:
  - Allergan
  - Tarsus
  - Eyenovia
  - Trukera
  - Thea Pharmaceuticals
  - Topcon
  - B&L
  - Sight Science
  - Avellino Labs
  - Visus

2

VISUAL FIELDS AND GLAUCOMA

Are they still cool?

Are they considered the standard of care?

How often?

Do they better measure early detection or progression?

Can we still rely upon them?

3

ELASIL, WANG ET AL , (AJO, MAY 2014)

- Conclusion – "In POAG substantial RNFL thinning or structural loss appears to be necessary before functional visual field defects become detectable."
- Study showed that there are tipping points on RNFL thickness after which VF defects appear
  - AVG mean RNFL thickness 89 microns BUT>>>
  - Superior RNFL tipping point was 100 microns
  - Inferior RNFL tipping point was 73 microns

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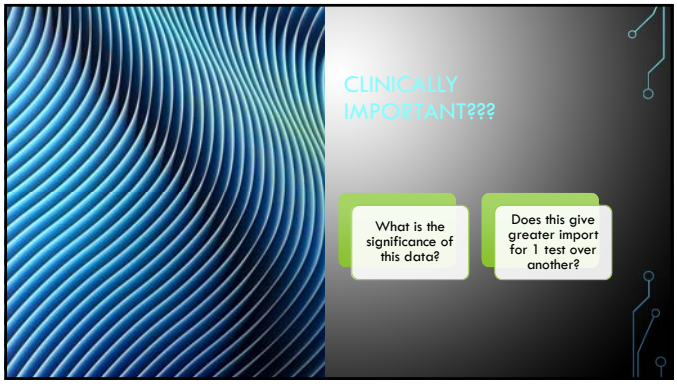


CLINICALLY IMPORTANT???

What is the significance of this data?

Does this give greater import for 1 test over another?

5

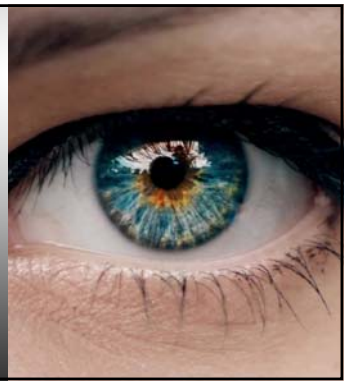
SPEAKING OF STRUCTURE VS FUNCTION..

- Banegas SA, et al. – J Glaucoma May 2015
- Compared VF, OCT and Stereo Photographs for their ability to pick up progression
- 68% of progressive cases identified by OCT were initially classified as G suspects
- 61% of progressive cases identified by VF were initially classified as POAG

6

CONCLUSION

- "Progressing Eyes detected by OCT had a higher mean RNFL thickness (>83 microns) and higher mean VFI than progressing eyes detected by VF or stereo photos."
- Soooo….
  - OCT is more likely to detect progression in pre-perimetric disease
  - VF and Photos better at detecting progression in more advanced stages of the disease



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- This gives further credence that ALL 3 of the tests have value INDEPENDENT of each other!!

8

VISUAL FIELDS ARE STILL REALLY COOL, BUT WHAT'S THE PROBLEM WITH THEM?

- Hard tests to take
- Subjective nature can cause poor reliability
- Poor reproducibility
- Fluctuation between tests
- Takes multiple tests to establish baseline and to show progression
- Patients don't seem to like them!!

9

SITA FASTER

- 2/3 of the test time of SITA Fast
- ½ the test time of SITA Standard
- The test time reductions are greatest in eyes with more severe VF loss
- The average 24-2 test time w/ SITA Faster is ~2 minutes

10

SITA FASTER - WHAT'S THE BIG DEAL?

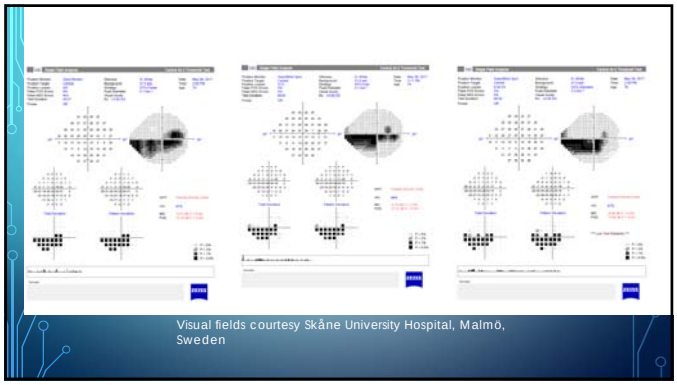
- Reduces test time by reducing time between presentation of test spots
- Does not dumb down the test!
- Gets rid of redundancies that have been discovered over past 20 years

11

SITA FASTER – SO AGAIN I SAY, WHAT'S THE BIG DEAL?

- Current recommendations are for more frequent visual field testing in early glaucoma (ECG, OGS)
- Faster test should allow the patients to be more accepting of the test and better test takers
- Faster tests should see Drs more willing to order tests more frequently
- More frequent VF testing should:
  - Facilitate earlier detection of glaucoma
  - Allow for earlier detection of progression
  - Better determine the rate of progression
- All of which allow us to better clinical decisions for our patients

12

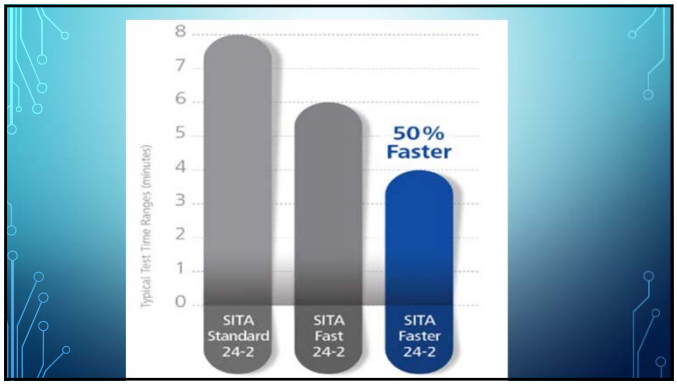


13

SITA FASTER VS SITA FAST

- SITA Faster produces similar results to SITA Fast
- No loss of reproducibility
- Improved reliability
- SITA Faster results integrate into the existing Guided Progression Analysis (GPA) of that individual patient

14



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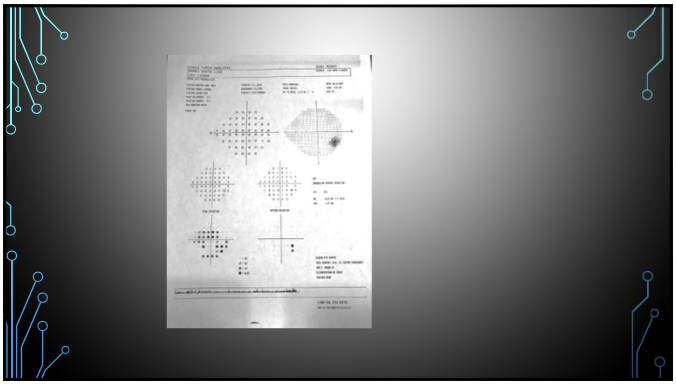

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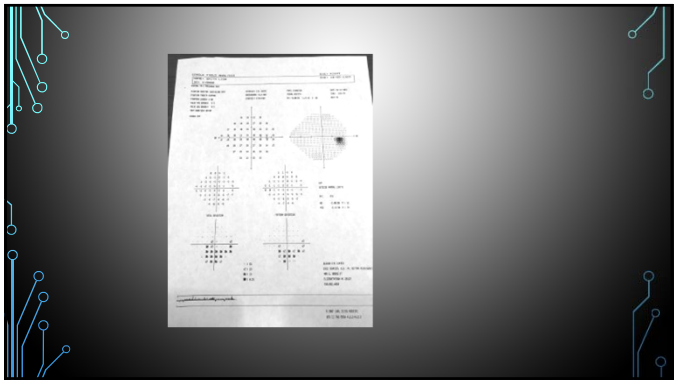

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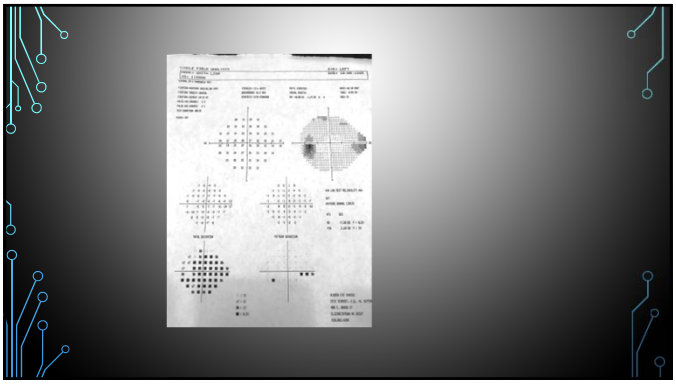

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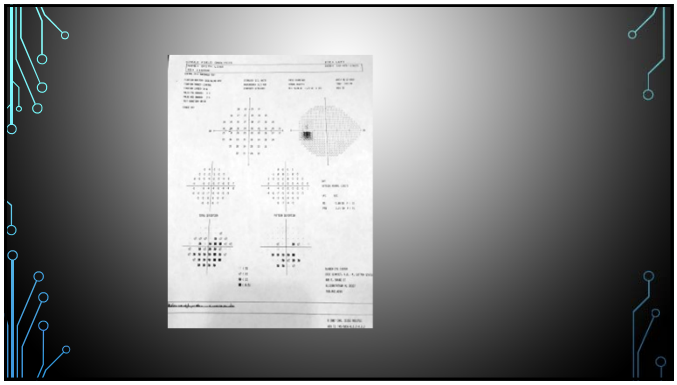

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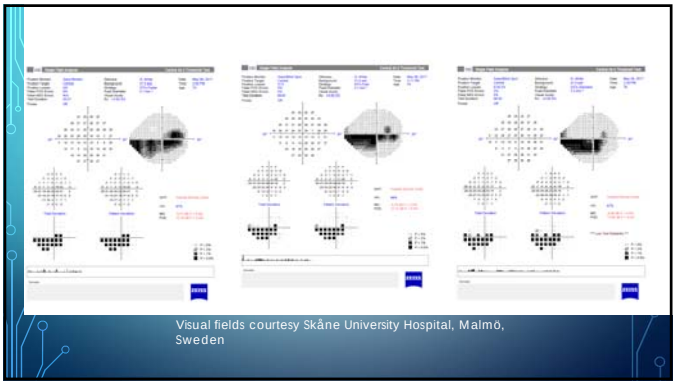

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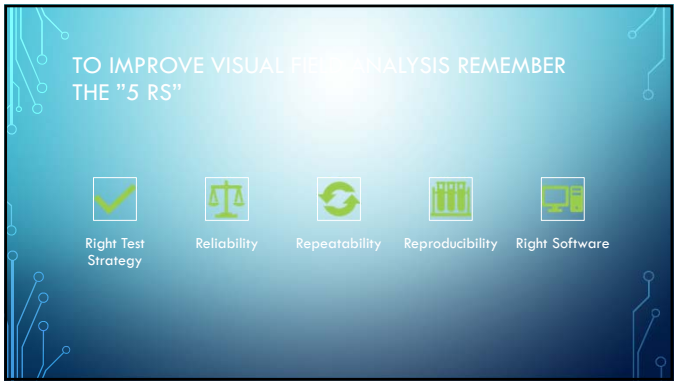

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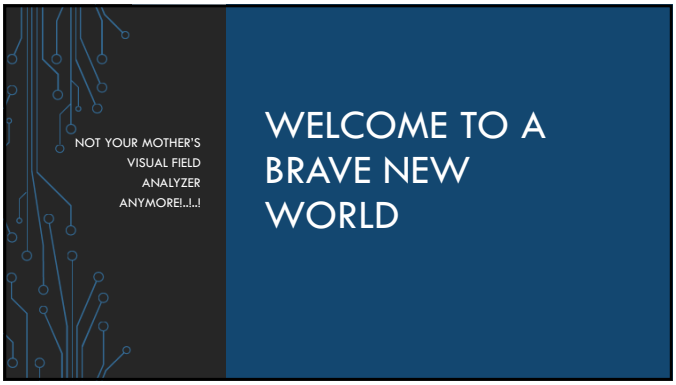

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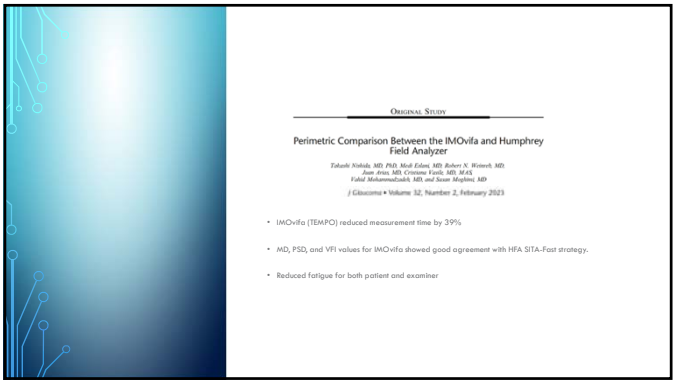


24

WHAT MAKES TEMPO FASTER?

- Designated dark room not required, **less patient movement** from room to room
- **No eye patching,** no stopping to occlude second eye – one continual, uninterrupted test
- **Stimuli presented to right and left eye randomly** – patient unaware of eye being tested at each point

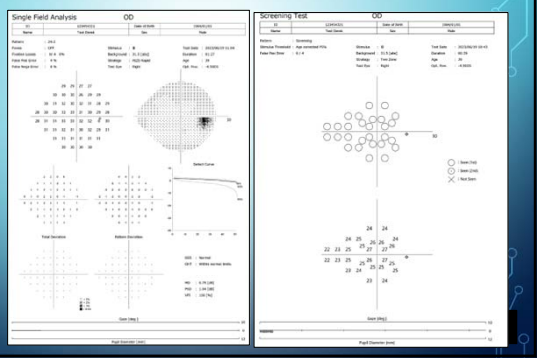
FAST	COMFORTABLE	ACCURATE
Faster than the gold standard in clinical testing.[1]	Random, binocular testing creates a comfortable "fun" patient experience.	Performance equivalent to the gold standard and excellent repeatability proven in peer reviewed research.[1,2]

Intuitive Interface | Includes All SAP Test Patterns | Functions in Ambient Light | Small Footprint

1. M Eslami, T Haddock, S Hoghooghi, JM Abreo, C Vasile, V Mohammadzadeh, RN Weinreb. Comparison Between a New Perimetry Device (IMOvifa®) and Humphrey Field Analyzer. ARVO Annual Meeting Abstract. IOVS June 2022, Vol.63, 1272 - A0401. 2. M Tafreshi, J Hariss, MA, D Kazanoff OD, M Dutton PhD, N El-Nimri OD PhD, and K Ciesielski Repeatability of Visual Fields Taken With the IMOvifa (Tempo) Binocular Perimeter. ARVO 2023. Poster Number 5926.

25

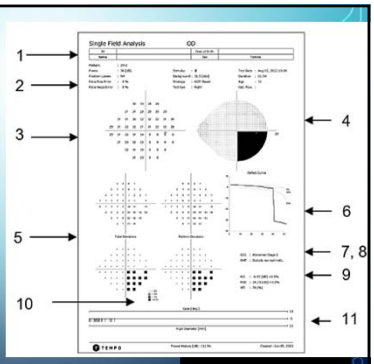
THRESHOLD & SCREENING REPORTS



26

SINGLE FIELD ANALYSIS (SF) IN DETAIL

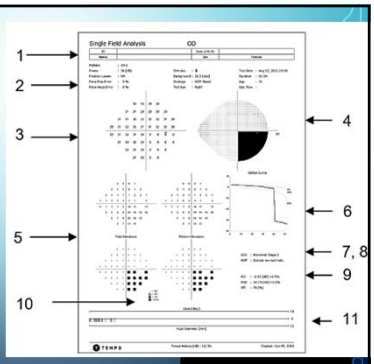
1. **Patient data**
2. **Information on the test and reliability indices.**
3. **Threshold values** (dB) are the measured sensitivity thresholds.
4. **Grayscale** is a graphical map of the threshold values.
5. **Deviation plots**
6. **Defect curve** – a graphical representation that provides a summary of the visual field and distinguishes between local and diffuse defects.



27

SINGLE FIELD ANALYSIS (SF) IN DETAIL

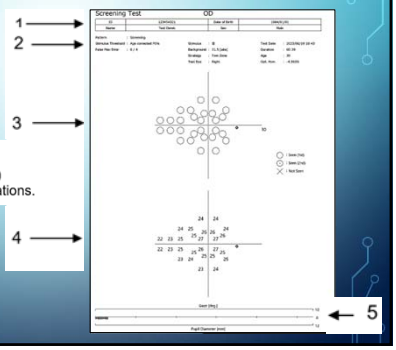
7. **GSS (Glaucoma Staging System)** classifies the field based on a plot of Mean Deviation (MD) and Pattern Standard Deviation (PSD).
8. **GHT (Glaucoma Hemifield Test)** analyses the asymmetry between the inferior and superior fields and gives a categorical value such as within normal limits after
9. **Global indices**
   - **MD (Mean Deviation)** is the average difference between the patient's overall visual field sensitivity compared to normal vision in the same age group.
   - **PSD (Pattern Standard Deviation)** is a measure of the threshold variability and indicates how the shape of the measured field differs from that of age-matched normal eye.
   - **VFI (Visual Field Index)** gives a percentage for overall vision. A VFI of 100% indicates no visual field loss whereas 0% means the patient is perimetrically blind.
10. **Probability symbols**
11. **Gaze tracking/pupil diameter**



28

SCREENING REPORT IN DETAIL

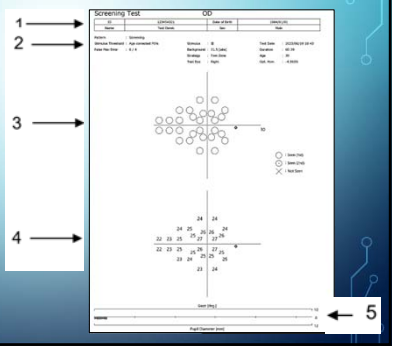
Points seen (first presentation).
Points seen (second presentation)
Points not seen after two presentations.



29

SCREENING REPORT IN DETAIL

1. **Patient data**
2. **Information on the test and reliability indices.**
3. **Plot of patient's response to a Goldman size III stimulus** presented at an intensity that an average subject of that age would see with 95% or 99% of the time depending on the option chosen.
4. **Plot of intensity of stimulus** (dB)
5. **Gaze tracking/pupil diameter**



30

WHAT ARE YOUR THOUGHTS ON TEMPO?

- Advantages?
- Disadvantages?
- Is this a screening device or diagnostic/progression device?
- What strategy do we order?
- How do we incorporate this into our busy day?

31

ARE VIRTUAL REALITY VISUAL FIELDS THE WAY OF THE FUTURE?

- PROVE IT TO ME!!!
- Normative data bases
- Consistent reliability
- Data I can depend upon
- DO THEY ACTUALLY WORK???

32

PRELIMINARY REPORT ON A NOVEL VIRTUAL REALITY PERIMETER COMPARED WITH STANDARD AUTOMATED PERIMETRY - JOURNAL OF GLAUCOMA 9/15/20

- "The global mean sensitivity of the Visu*ALL* and the HFA correlated significantly in both normal (r=0.5, P=0.001) and glaucoma (r=0.8, P<0.001) groups. The mean sensitivity of all quadrants also correlated significantly in both groups. The Visu*ALL* mean sensitivity had a greater (0.98) Receiving Operating Characteristic (ROC) curve than HFA (0.93) mean sensitivity (P=0.06) in discriminating normal versus glaucoma.
- There was an excellent correlation between the VisuALL and the SAP in normal and glaucoma patients and VisuALL showing a high diagnostic performance."

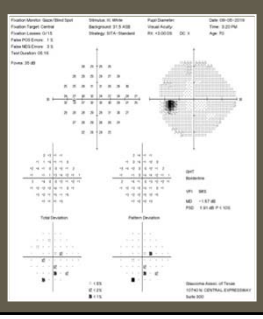
33

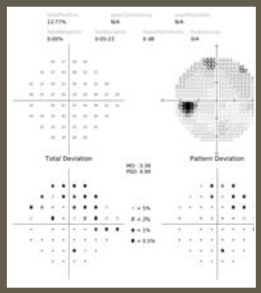
OLLEYES - VISUALL

34

35

Visuall vs HFA printout



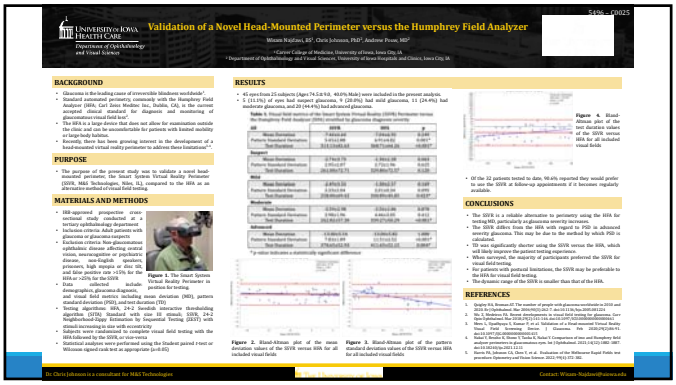


36

VISUALL VRVF

- What can it do?
- What CAN'T it do??

37



38

BILLING AND CODING CONCERNS

- Is this a screening or ordered test? (That will determine the fee)
- 92083 – again diagnosis must correlate with procedure code used
- Test must be ordered and interpreted
- What do you do if screening shows an abnormal result?

39

THE STRUCTURE VS FUNCTION DILEMNA

- Structural damage leads to functional damage
- Do they always correlate though?
- If they don't why???

40

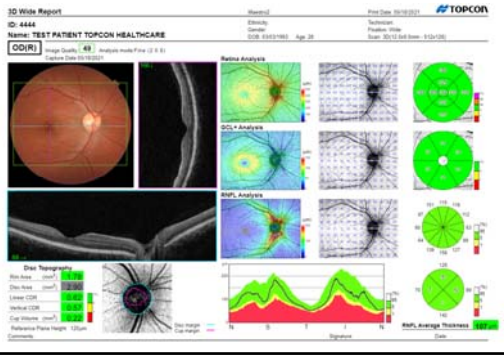
THIS ISN'T YOUR FATHER'S OCT REPORTS ANYMORE!.!.!.

WELCOME TO THE BRAVE NEW WORLD!!

41

3D WIDE STANDARD REPORT

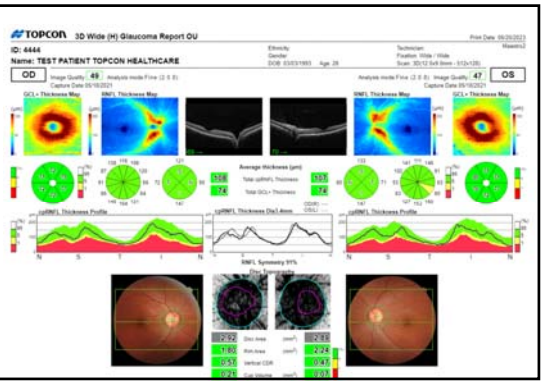
Your new standard. One scan blanketing the posterior pole generating RNFL, ONH, GCL and ETDRS data of nerve and macula.



42

3D WIDE GLAUCOMA REPORT OU

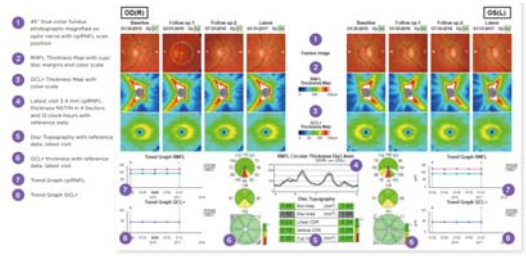
One scan per eye presents exhaustive data for the Glaucoma suspect and known Glaucoma patients alike.



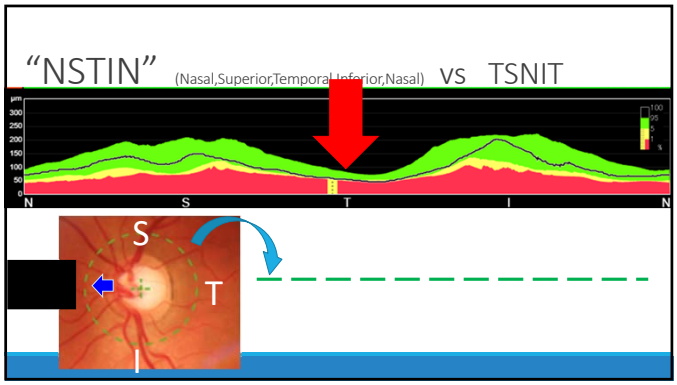
43

3D WIDE TREND REPORT OU

3 Key Metrics presented over time from just one scan per eye.



44



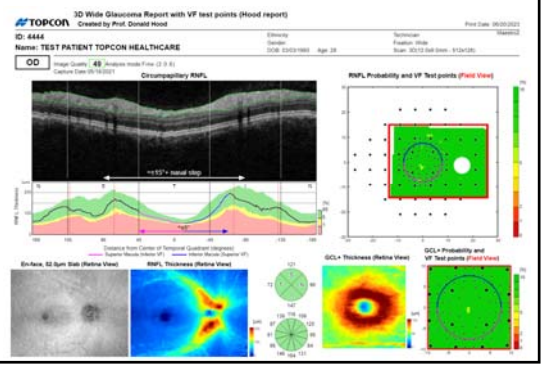
45

HOOD REPORT FOR GLAUCOMA

Generated from one **3D Wide Scan**

RNFL and GCL Probability Maps

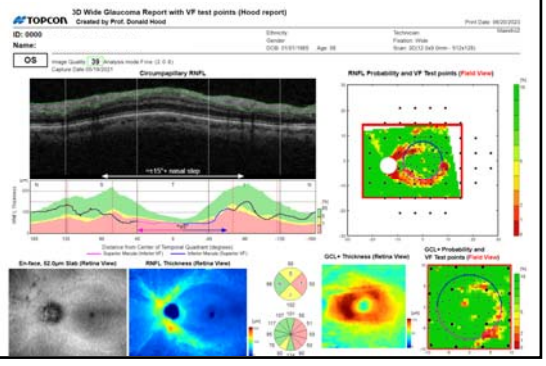
Consider for screening, Glaucoma suspects as well as known Glaucoma patients



46

HOOD REPORT FOR GLAUCOMA

Reference STRUCTURAL RNFL and GCL deficiencies with FUNCTIONAL vulnerability.



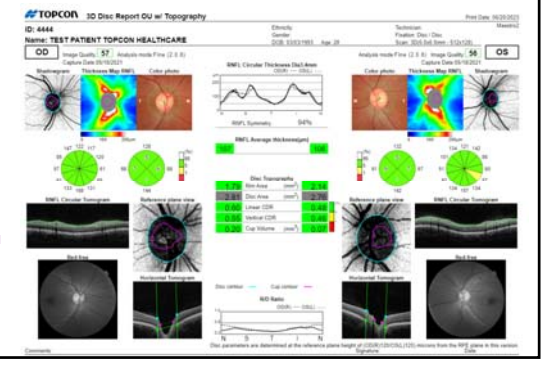
47

3D DISC REPORT OU

4 subjective fundus images of the optic nerve per eye

"Classic" **3D Disc Scans**

Cannot be used to generate the **Hood Report for Glaucoma**



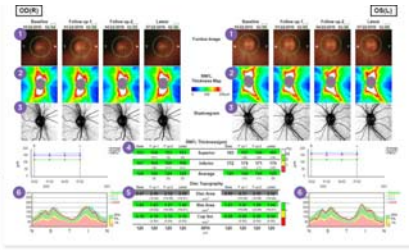
48

3D DISC TREND REPORT OU

Color, RNFL and GCL changes over time

OD/OS NSTIN reference data

Key change-over-time metrics presented in **"Spreadsheet-like" table.**



49

50

24 HOUR IOP CONTROL

New data and new recommendations

51

HOW IOP IS USUALLY MEASURED

- Typically a **single observation**
- During **office hours**
- A moment in time or representative of the entire day?
- Are we missing spikes, peak, or elevated IOPs at other times of day?

52

WHEN IS THE PEAK IOP?

- 3,025 IOP readings on 1,072 eyes
- NTG, POAG, Pre-perimetric G, OHT
- Results:
  - Peak IOP – 7AM – 20.4%
  - Noon – 17.8%
  - 5PM - 13.9%
  - 9PM – 26.7%
    - Jonas, Budde, et al. AJO, June 2005;139:136-137

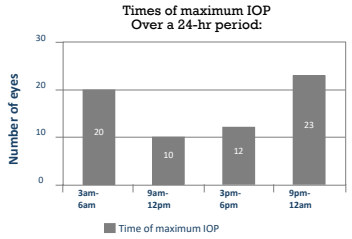
53

JONAS STUDY CONCLUSION

- "Any single IOP measurement taken between 7AM and 9PM has a higher than 75% chance to miss the highest point of the diurnal curve."
- Stresses the need for serial tonometry.

54

PEAK IOP OUTSIDE OFFICE HOURS FOR 2/3 OF EYES



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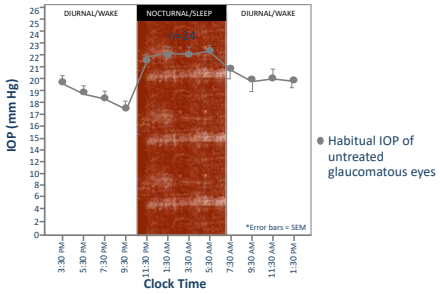
IOP IS HIGHER AT NIGHT



56

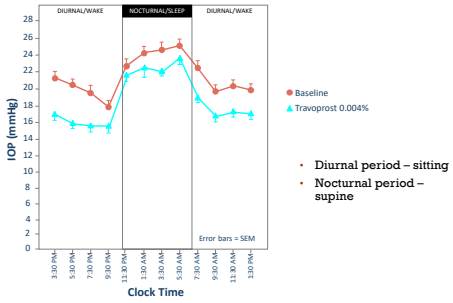
OBSERVATIONS

- Reducing IOP reduces risk of progression[1-5]
- Peak IOPs often occur outside normal office hours[6-9]
- IOP during office hours does not provide a complete picture of diurnal and nocturnal IOP[6-9]
- What does this mean about your choice of medical therapy?

1. Heijl A, et al. *Arch Ophthalmol.* 2002; 120(10): 1268-1279.
2. Kass MA, et al. *Arch Ophthalmol.* 2002; 120(10): 701-713.
3. AGIS Investigators. *Am J Ophthalmol.* 2000; 130(4): 429-440.
4. Lichter PR et al. *Ophthalmology* 2001; 108: 1943-1953.
5. CNTGS. *Am J Ophthalmol.* 1998; 126(4): 487-497.
6. Nakakura S, et al. *J Glaucoma* 2007; 16(2): 201-204.
7. Mosaed S, et al. *Am J Ophthalmol.* 2005; 139: 320-324.
8. Hughes E, et al. *J of Glaucoma* 2003; 12: 232-236.
9. Liu JH et al. *Invest Ophthalmol Vis Sci.* 2003; 44: 1586-1590.

57

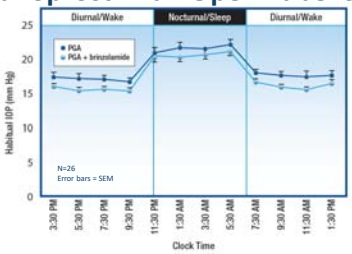
EFFECT OF TRAVOPROST ON DIURNAL AND NOCTURNAL IOP (CONT'D)



- Diurnal period – sitting
- Nocturnal period – supine

58

Brinzolamide: Adjunct to Latanoprost in an Open-Label Study



59

SO HOW DO WE BEST MEASURE 24 HOUR IOP

- Multiple iop readings
- At home monitoring
  - Triggerfish
  - Icare "home" tonometer

60

WHAT CAN WE DO TO BETTER CONTROL IOP OVER A 24 HOUR PERIOD?

- Pick the right drop(s)
- Choose the right procedure
- Identify the Problem
- Get the necessary data

61

In home tonometry

62

Icare home tonometer

Rebound tonometer
No anesthesia
Px is seated
Automatic od/os recognition
r/g lights guide alignment

Push button "switch"
Can take 1 reading or 6 consecutive
Data stored in instrument
Download data in doctor's office

63

Icare home tonometry

Readings are not printed out or displayed to patient
Readings are in mm hg
No cpt code
Not reimbursible – because it is administered by the px
Px rents machine from dr
- Rental rate is set by dr
- Abn (waiver of benefits) must be signed by px

64

Icare home tonometer is it feasible?

Pronin, brown, et al – jama ophthalmol (online) 8/31/17
Report on reproducibility and acceptability of iop as measured by patients

All pxs had oht or poag
Gat and icare home tonometry performed by dr in office
Icare home tonometry performed by px in office

65

Pronin et al - results

73/100 pxs showed measurements w/in 5mm of doctor
Icare home readings were consistently lower than iop/gat
This was more pronounced in lower ranges of iop

Self tonometry was judged "easy and comfortable" by most patients
92% of pxs reported: " they would be happy to perform self-tonometry in future"

66

Tagaki et al
Jglaucoma 26(7): 613-618, july 2017

Compared iop measurements of goldmann tonometry with icare home tonometry both by patient and by doctor

Mean iop ranges
- Gat: 7- 20 mm Hg
- Icare (px): 6-24mm hg
- Icare (dr): 6-25mm hg

Was found to be "feasible"

Icare home showed a tendency to record higher iop readings as compared to gat

67

So…

More iop readings give us more data points from which to make decisions

It is reproducible

It is feasible

But…

68

I have some questions

1. Is a 5mm difference between patient and doctor acceptable?
2. Do elevated iop readings on icare home lead to vf defects
3. Is this true 24 hr data?
4. Will this become standard of care?
5. Will this data lead to a change in treatment for the px?

69

Triggerfish cls

Wearable cl sensor
- Single use cl (8.4, 8.7, 9.1 bc), 14.1 mm diameter, 585 microns thick

Also incorporates:
- 2 strain gauges
- Microprocessor
- Periorbital adhesive (holds receiver antenna)
- Recorder sleeve

70

71

Triggerfish cls

Worn for 24 straight hours

Telemetric sensor

Takes 30 seconds of readings at 5 min intervals for 24 hrs

It is not tonometry

It doesn't measure iop

Measures strain differences

72

Strain differences

Measures change in intraocular volume

Strain differences may measure change in iop indirectly

Reflects rigidity of globe and ocular elasticity

These measures are relative to each other –(but not to tonometric iop)

So these measures cannot be related to traditional tonometry

73

But…

Strain related factors may be a more accurate reflection of an eye's susceptibility to glaucomatous damage

Strain factors are also affected by blink, sleeping, exercise etc

So it may be more a predictor of progressioin as opposed to measuring iop spikes

74

Triggerfish cls pros

Continual 24 hr data

No px involvement

Gathers data while sleeping, standing, sitting, during physical activity

It is felt that iop changes with those activities as well

75

Triggerfish cls cons

Uncomfortable

Ugly

Expensive

May cause corneal issues

Not approved in u.s.

76

Triggerfish cls

so what do y'all think?

77

So a man walks into his optometrist's office…

He is diagnosed with glaucoma,

What is your initial treatment??

78

LiGHT Study

SLT versus eye drops for first-line treatment of ocular hypertension and glaucoma (LiGHT): a multicenter randomized controlled trial

Gus Gazzard, Eugenias Konstantakopoulos, David Garway-Heath et al

www. thelancet.com Vol 393 April 13, 2019

Pxs had to have mild or moderate glaucoma based on VF criteria

Target IOP reduction 20-30% (depending on severity)

Standard SLT energy protocols

Medicine group – 1st line PGA, 2nd Line Beta blocker, 3rd line CAI or Alpha agonist

Both groups followed for 36mths

79

LiGHT study outcomes

Both groups showed similar efficacy in lowering IOP

- 16.3mm Hg Drop group, 16.6 mm Hg SLT Group
- 78.2% SLT group required no drops, 12% required 1 drop
- 64.6% drop group controlled on 1 drop, 18.5% required 2 drops
- 0% SLT Group required trab, 3.3% Drop group required trab
- 93% SLT group at target IOP, 95% Drop group

SLT Group spent 202 pounds less on care

So what does this mean for us , our clinics and our patients??

80

Does The LiGHT Study…

1) Change your impression of the efficacy of SLT?

2) Change your impression of when you would recommend SLT for your patients?

3) Change your impression on who may be good candidates for SLT?

81

82

Belkin DSLT

Rapid, non-contact Direct SLT

Delivers similar energy as traditional SLT

Automated delivery of energy through limbus (transconjunctival)

Without Gonioscopy

Will be approved in US within months!!

83

DSLT Data

Baseline IOP 26.7-

- Patients were washed out of all meds
- Some pxs were treatment naïve

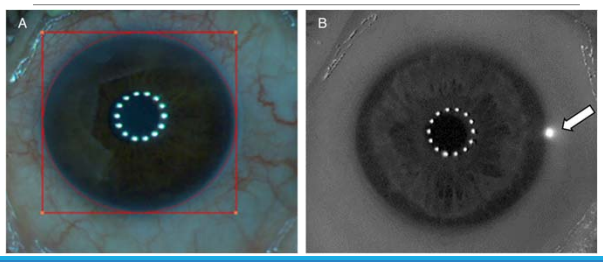
After tx IOP

- 1 mth – 21.7mm Hg (18.1% reduction)
- 3 mth- 20.8mm HG (21.4%)
- 6 mth 21.5mm Hg (18.8% reduction)

At 6 mths medication need reduced from 1.6 to 0.4

84

Automated Direct SLT



85

#This Is A BFD!!

ARE WE READY???

86

But really… Is There Anything New??

Iyuzeh-

(latanoprost 0.005%)

Thea Pharmaceuticals

Let's talk about this…

87

Does that sound familiar?

Monoprost (in Europe) – the market leader in PGA in Europe

This actually is PRESERVATIVE FREE latanoprost!!

Single dose container

But does it really work??

88

Iyuzeh – Phase 3 data

Compared to Xalatan (Switch Study)

Stable POAG pxs on Xalatan

8 day washout period

3 months on Iyuzeh

IOP reduction was 4-8mm Hg on Xalatan

IOP reduction was 3-8mm Hg on Iyuzeh

Baseline IOP was 19mmHG!!

89

Iyuzeh – Phase 3 data- Adverse Effects

Xalatan group
- Hyperemia – 31%
- Eye Irritation – 34%

Iyuzeh Group
- Hyperemia – 34%
- Eye irritation – 19%
- ZERO reports of SPK

90

European data – Higher baseline IOP (24mm Hg)
- IOP lowered to 15.5mm Hg
- Same rate of adverse effects

Bachrach data (2023 AGS)
- 12 week trial comparing to Xalatan
- Similar IOP reduction (as measured by ability to get IOP <18mm Hg)
- 2% experienced redness or ocular irritation
- 0% SPK
  Fewer ocular side effects (13.9% vs 22.5%)

PASSY study
- 97% tolerated drop
- AT usage decreased 24%

91

#What's The Big Deal??

OSD is an epidemic in glaucoma

Will this improve compliance?

Will this cost $1M??

Is it better than what we have?

92

Add Rhopressa?

Switch to a combo drop??

Switch to Rocklatan??

Switch to another PGA?

Add a combo drop??

SLT??

93

A lot of money is being spent on delivery systems

These may be cheaper alternatives

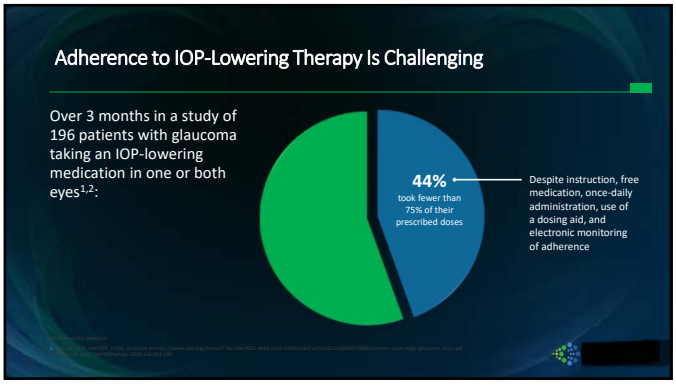
Optometry cannot sleep on this

94

And Now It's Time To Talk About Compliance!!!!!

This is so not Cool…

95

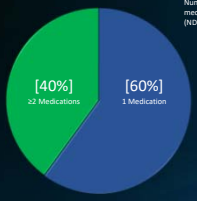


96

Individualizing the Target IOP

Target IOP should be individualized and updated as needed

- Periodically reassess the IOP target by comparing optic nerve status (optic disc appearance, quantitative assessments of disc and nerve fiber layer) and VF with previous examinations[1]
- Consider switching or adding medications if target is not yet achieved with initial therapy[1]
- Many patients require 2 or more medications to achieve target IOP[2]



97

Adherence to IOP-Lowering Therapy Is a Complex, Multifaceted Problem[1,2]

Adherence includes both persistency and compliance issues[1]

Components of successful adherence[1]

- Successfully obtain medication
- Correctly instill drops into eye
- Use drops at appropriate times
- Use drops every day without gaps

98

Compliance really is a hot topic

Dr David Friedman – OGF Educators Meeting 9/19

Looked at compliance studies in glaucoma- found that 70% compliance with medications was average

But is that good enough to preserve VF?

Friedman also showed that those who said they missed their drops some of the time… actually used their drops ~50% of the time.

That was much worse than those who say they never miss their drops

99

Predictors of Poor Adherence – Friedman 2019

Gaps In Visits

Patients Don't Understand Severity Of Disease

Cost of Drops (25%)

Those who Travel A Lot

Younger Pxs and Very Old Pxs

African-Americans

Those In Poor Health

- These drop adherence to <60%

100

Compliance, adherence and side effects of therapy

Compliance decreases the more bottles Rx'd

Robin – Each extra bottle used decreased compliance by 1/3

The more topical meds used the more ocular side effects occur

OSD in G pxs (way) higher than initially thought

60% of G pxs use ocular lubricants

101

What are the biggest barriers to proper compliance?

1. Forgetfulness

2. Ability to put drops in

3. Unaware of the importance of the drops

Cost was not in the top 5!!!

102

Ways To Improve Compliance

See Pxs more frequently… especially early in treatment

Improve tracking system – better identify no shows

Call/email appointment reminders

Reminders to pxs to take their drops

Change Dr/Patient intervention

G pxs ask 3.2 questions at visit whereas in other chronic diseases pxs ask ~ 6 questions/visit

103

Speaking of NTG…

- Do we know anything new about it?
- Brand new 8 year data
- Over half progressed
- Thinner corneas and those with disk hemes more likely to progress
- Progression defined as either disk or VF changes

104

More New NTG stuff

- Peak IOP in progression group - 17.6mm Hg
- Peak IOP in non-progressors – 15.8mm Hg
- Mean IOP in both groups - ~13.1
- So consistently low IOP is crucial
- Squash the spikes, set a ***LOOOW*** IOP
- Age of pxs didn't matter

105

Treatment Considerations in NTG

- Avoid beta-blockers
- Keep Diurnal Curve Tight!!
- Choose a Low Target and Identify The Peak

106

1 MORE THING

NTG PXS TEND TO BE "OVERDIPPERS"
OVERDIPPERS TEND TO LOSE VF AT A HIGHER RATE

SO HOW DO YOU DETECT OVERDIPPERS?

AND WHAT DO YOU DO ABOUT IT?

107

Disk hemorrhages and Rate of Progression (Medeiros et al)

- Cohort of the DIGS
- Pxs followed for 8 years for VF progression (using the VFI)
- 20% had disk hemorrhage
- Eyes with disk heme had more than double the rate of VF loss
- Eyes w/ more than 1 disk heme showed an even higher rate of VF progression
- Persons with disk heme in general had a more severe glaucoma

108

Speaking Of Optic Disk Hemorrhages

- BUDENZ ET AL, (OHTS GROUP) – AJO 2/17
- 13 YEAR DATA

- ODH ARE AN INDEPENDENT PREDICTOR FOR POAG
- ODH ARE PREDICTIVE OF PROGRESSION
- PREDICTIVE FACTORS FOR ODH ARE SIMILAR TO THOSE FOR POAG (IN OHT PXS)
  - Thin corneas
  - Thinner rims
  - Higher IOP
  - Older age

109

NORMAL TENSION: ABNORMAL RESULTS

- ANDERSON et al AJO
  - EXAMINED NTG'S FOR MULTIPLE VARIABLES (AGE, GENDER,BP AND MIGRAINES)
  - MIGRAINES,DISC HEM'S MOST NOTABLE RISK FOR PROGRESSION
  - AGE , RACE NEXT
  - 230 PATIENTS/NTG/IOP< 20mm Hg

110

NTG

- 99 WOMEN/61 MEN
- 23 WOMEN WITH H/O MIGRAINES
- 2 MEN
- WOMEN WITH MIGRAINES HAD FASTEST RATE OF PROGRESSION

111

Normal Tension Glaucoma: Clinical Features

- Acquired pits of the optic nerve more common
- Peripapillary atrophy more common
- Drance hemorrhage more common
- Focal nerve fiber layer defects
- Focal notching of the Optic Nerve
- Visual field defects with steep margins and closer to fixation

112