Program overview

Wednesday October 29, Workshops – Practical hands-on training

09:00 – 11:30  Course 1  
Octopus 101 & 900 in everyday practice

12:00 – 13:00  Lunch (Bistro of the historic museum)

13:30 – 16:00  Course 2
Octopus 101/900 Goldmann  
Kinetic Perimetry in depth

Wednesday October 29, Official Reception at the Historic museum

16:30 – 19:00  Official Reception
• Welcome note by Reiner Herrmann, Marketing Director of Haag-Streit
• Pre-opening guided tour through the Albrecht von Haller exhibition
• Apéro riche

Thursday October 30, / Haag-Streit Colloquium: 5 FMH points

Session 1: Static perimetry basis, interpretation, classification and structural correlation

09:00 – 09:10  Mario Zulauf, CH  
Fritz Dannheim, DE  
Welcome message and introduction

09:10 – 09:30  N R Rangaraj, IN  
Single Field analysis and common pitfalls (see page 5)

09:30 – 09:45  Devindra Sood, IN  
Choosing appropriate programs and strategies (see page 6)

09:45 – 10:00  Paolo Brusini, IT  
Classification of glaucomatous visual field damage using automated perimetry (see page 7)

10:00 – 10:15  Matthias Monhart, CH  
New visual field analysis functions: The Polar Graph and the Cluster Graph (see page 8)

10:15 – 10:30  Alain Lefrançois, FR  
Our experience with the new software OFA (see page 9)

Session 2: Kinetic perimetry, Metamorphopsia and RAPD

10:50 – 11:05  Fiona Rowe, UK  
Comparison between Octopus and Goldmann kinetic fields (see page 10)

11:05 – 11:30  Ulrich Schiefer, DE  
Semi-automated kinetic perimetry (SKP) – basic principle and impact on traffic ophthalmology, suitability testing and expert opinion (see page 11)

11:30 – 11:45  Eiko Arimura, JP  
How do patients perceive Metamorphopsia under monocular and binocular conditions? (see page 12)

11:45 – 12:05  Aki Kawasaki, CH  
Understanding the Basis of the Relative Afferent Pupillary Defect (page 13)

Session 3: Digital documentation of slit lamp and IOP examinations

14:00 – 14:25  Tarek Sharawy, CH  
Insight into Gonioscopy and it’s digital documentation with the slit lamp (see page 14)

14:25 – 14:50  Christopher Mody, UK  
Slit lamp photography (see page 15)

14:50 – 15:10  Thomas Beutler, CH  
IOP measurement - looking into today’s alternatives

Session 4: Optical biometry

15:30 – 16:00  Mike Holzer, DE  
A novel biometry measuring device: Accuracy and clinical applications (see page 16)

16:00 – 16:30  David Goldblum, CH  
Optical biometry – comparison of instruments (see page 17)
Friday October 31, 4 FMH points

Session 5a: Moderne Gesichtsfeld-Analyse anhand von Fallbeispielen

09:00 – 10:00 Ernst Bürki, CH Einführung in die neue Octopus Field Analysis Funktionen anhand von Fallbeispielen
10:00 – 10:30 Moderatorenteam Diskussion eingereichter Fallbeispiele

Session 5b: Recent advances in visual field analysis applied in case studies

09:00 – 09:40 Matthias Monhart, CH From PeriTrend to EyeSuite – Introduction of the new Octopus Field Analysis Functions
09:40 – 10:00 Fumi Tanabe, JP Evaluation of Structural and Functional Changes in Glaucoma Using Polar Diagram (see page 18)
10:00 – 10:30 Moderator team Discussion of submitted cases

Session 6: Understanding and selecting test strategies

10:50 – 11:10 Fiona Rowe, GB Case studies comparing Octopus G programme and Humphrey 24-2 programme results (see page 19)
11:10 – 11:15 N R Rangaraj, IN Comparison Of A Fast Strategy (TOP) with a Modified Full Threshold Strategy (Dynamic) (see page 20)
11:15 – 11:30 Manuel González de la Rosa, ES TOP and Pulsar fluctuation (see page 21)
11:30 – 11:45 Hiroki Nomoto, JP Detectability of glaucomatous functional and structural changes (see page 22)

Session 7: Detect progression and asses the rate of progression

13:45 – 14:00 Sachiko Okuyama, JP Detection of Local Visual Field Loss Progression in Patients with Diffuse Improvement using Cluster Trends Analysis in Octopus Field Analysis (OFA) (see page 23)
14:00 – 14:30 Paul Artes, CA Rates of Progression in Glaucoma (see page 24)
14:30 – 14:45 Matthias Monhart, CH Assessing the global and regional Progression Rate (see page 25)
14:45 – 15:00 Dr. Federico Sáenz-Francés, ES Advantage of the short test duration of the TOP strategy (see page 26)

Session 8: Diagnosis beyond the central visual fields

15:15 – 15:45 Richard Weleber, US Full-field Static and Kinetic Perimetry in Retinal Disease
15:45 – 16:05 Anja Palmowski-Wolfe, CH Clinical aids in the diagnosis of visual complaints (see page 27)

Friday Evening, official excursion (included in Friday’s registration)

16:15 – 22:00 Excursion to the mountain Niesen
- Transfer via bus and rack railway
- A nice view into the sunset (if the weather is good)
- Dinner
Saturday November 1, 4 FMH points

Session 9: An update on methods for early diagnosis

09:00 – 09:15 Chota Matsumoto, JP Visual function specific perimetric tests and structural changes in early and preperimetric glaucoma (see page 28)
09:15 – 09:30 Knut Luraas, NO Is there a learning effect in CFF perimetry? (see page 29)
09:30 – 09:45 Christoph Castelberg, CH The effects of defocusing in PULSAR perimetry (working title) (see page 30)
09:45 – 09:57 Mario Zulauf, CH The learning effect with the Pulsar Perimeter in Normals, Ocular Hypertensives, and Glaucoma (see page 31)
09:57 – 10:10 Wiebke Ehrhorn, DE Conventional W/W-Perimetry (Octopus 1-2-3) and Flicker Fusion Perimetry (Pulsar): Indices for the Glaucomatous Visual Field in Comparison (see page 32)

Session 10: New solutions for perimetric challenges

10:30 – 10:45 Manuel González de la Rosa, ES Progression analysis of glaucoma using several morphological and functional criteria (see page 33)
10:45 – 11:00 Fritz Dannheim, DE Display of follow-up in glaucoma combining perimetry and disc analysis in a three-dimensional plot (see page 34)
11:00 – 11:15 Shigeki Hashimoto, JP The Evaluation of Fully Automated Kinetic Perimetry (Program K) by comparing it to Semi-Automated Kinetic Perimetry (SKP) in patients with visual field loss (see page 35)
11:30 – 11:48 Hans Bebie, CH Visual field trend analysis – a population based test (see page 37)
11:48 – 12:00 Matthias Monhart, CH The logic behind the clear Text analysis in the new Octopus Software (see page 38)

Session 11: On the future of perimetry

12:05 – 12:30 Ulrich Schiefer, DE Assessment of the entire (80 degree) visual field with a new fast thresholding algorithm (GATE) (see page 39)
12:30 – 13:00 Richard Weleber, US Modelling and Analysis of Full-field Static Perimetry
13:00 Farewell

The program is subject to change without notice. Last update Oct 24, 2008

We thank our sponsors
Abstracts and details

Wednesday October 29

Course 1  Octopus 101 & 900 in everyday practice
- Understanding perimetry
- Application hints
- Preparing the instrument
- Instructing the patient
- Performing the test
- Judging reliability

Course 2  Octopus 101/900 Goldmann Kinetic Perimetry in depth
- Preparing the instrument
- Instructing the patient
- Understanding kinetic perimetry
- Individual kinetic test
- Create automated tests

Course 3  Octopus 300/301/311 in everyday practice
- Understanding perimetry
- Application hints
- Preparing the instrument
- Instructing the patient
- Performing the test
- Judging reliability

Course 4  Octopus 300/900 Early Diagnostic methods
- Understanding Blue/Yellow and Flicker perimetry
- Instructing the patient
- Overcome learning effects
- Reliability issues

Course 5  Slit lamp imaging (based on the BQ / IM900)
- Operation of the IM900
- What can be photographed
- How to optimize the illumination
- Working with depth of field, shutter time and history trigger
Systematic interpretation of Octopus single field reports ‘Ten step approach’

The Octopus Single field report gives all the relevant data, actual values, statistically calculated graphs and numbers called indices on a single page. Visual fields should be correlated with clinical findings for which a systematic ‘Ten Step Approach’ to interpretation of the Octopus Visual field is described.

The Octopus Single field Printout format
The Octopus Seven in one printout contains the raw results from the visual field examination and easy to read data interpreting the results of the test. The single field report print out also presents the statistical calculations, images, graphs, plots and indices. The ‘Ten Step Approach’ makes the interpretation in a clinic setting easy to read and correlate the visual field findings.

The Ten Steps are:
1. Patient Data: information about the patient
2. Examination data: Details about the examination and reliability
3. Value table: This table shows the measured values. All further statistical and graphical details are derived from this set of raw data
4. Comparison table: Representing the local difference between the measured values and the normal values valid for the patient’s age
5. Corrected comparison table: Shows the defects discounting any uniform depression caused by a cataract or other diffuse loss, eg. Refractive errors.
6. Grayscale (in color or in B/W): An overview of the pattern of visual field defects for the doctor and can be used to explain the nature of the problem to the patient.
7. Cumulative defect (Bebie) curve: An arrangement of all test data from the highest value to least from left to right which is overlaid on a statistically age corrected normal for comparison.
8. Probability plots: Graphical representation of the probability or significance of a defect.
9. Visual field indices: Condenses the visual field results in a few numbers.
10. Structure function correlation

Conclusion
The Analysis of visual field should be correlated with clinical examination, failure to do so will result in wrong conclusions drawn from a test which is essentially a computer assisted subjective evaluation. Common pitfalls may distort this structure function correlation. The session highlights the Single Field Printout and commonly encountered pitfalls.
Perimetry is the evaluation of visual field. Many eye diseases like glaucoma alter the visual function in a characteristic pattern which makes computer assisted Perimetry a valuable tool for diagnosis and follow-up. Visual field testing compliments other parameters like structure changes in the optic nerve head in decision making as in glaucoma to chart progression of the disease. The central 30° visual field examination using automated perimetry is currently the gold standard in evaluation, management and follow-up of glaucoma. Non glaucomatous causes of visual field changes may also be diagnosed and followed up.

It is important to understand the strategy of visual field examination and which set of test points is being tested to maximize the yield of data for proper diagnosis. The choice of test strategies offered in the Octopus perimeter meet different clinical situations of diagnosis and follow-up. The choice of normal full threshold testing strategy, the Dynamic Strategy (Weber) and Tendency oriented perimetry (TOP) is offered by Octopus perimeters.

Conclusions
The presentation will let the audience understand and choose the correct Strategy and Program for the pathology under investigation.
<table>
<thead>
<tr>
<th>Title</th>
<th>Classification of glaucomatous visual field damage using automated perimetry.</th>
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<tbody>
<tr>
<td>Author</td>
<td>Paolo Brusini</td>
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<td>Co-Authors</td>
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<td>Commercial relations</td>
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| Abstract | The classification of glaucomatous visual field defects based on severity is important for numerous reasons, which include: to distinguish between healthy and diseased individuals; to have homogeneous grouping criteria when perimetry is used to define the severity of glaucoma; to adjust therapy on the basis of disease severity; to describe visual field conditions in a short and simple format; to monitor the progression of the disease; and to provide a common language for both clinical and research purposes. Numerous severity classification methods have been proposed, although none have had widespread use in clinical practice. Other methods, like the cumulative defect curve (Bebie curve), can be used to distinguish the type of visual field loss as diffuse, localized, or mixed. Most methods of classification have little, if any, clinical usefulness. Two case scenarios can be useful to explain why any one method has failed to have a widespread acceptance:  

1) the method is simple and easy, however, subjective, not standardized, and has a poor reproducibility; or,  

2) the method is accurate and standardized, but is too time-consuming, and requires complicated calculations or software which is either rarely used or not easily available.  

The choice regarding what method is best naturally depends on the purpose it intends to serve, which needs to be quick and easy in a routine clinical setting, yet standardized and precise in scientific research studies. No method currently used is perfect. Moreover, one must also keep in mind that perimetry, in itself, is a subjective psychophysical testing method, and thus any classification system that is based on this type of data can never be completely accurate and reproducible. |
Title | New visual field analysis functions: The Polar Graph and the Cluster Graph
---|---
Author | Matthias Monhart
Co-Authors | Hans Bebie, Ernst Bürki
Commercial relations | E
Support if any | Haag-Streit AG
Keywords | Structure-function correlation, nerve fibre bundle map, cluster

Abstract

**Purpose**
The Glaucomas characteristically affect adjacent nerve fibre bundles leading visual information from the optic nerve and further to the visual cortex. Nerve fibre bundle defects appear in different locations of the visual field over time. However, these locations usually are along the same affected nerve fibres. Thus, bundling of the information of test locations along the same nerve fibres leads to a more stable base to identify regional changes.

**Methods**
Our group applied various nerve fibre bundle maps and models in order to find the description with the best possible correlation between visible nerve fibre bundle defects seen in the HRT-II and local defects in the Octopus G test results applying the dynamic and the normal strategy.

**Results**
We found the best agreement with a nerve fibre drawing of Hogan et al. Subsequently we based on this graph to create a polar graph (A), where we project all local visual field defects to the optic disc. In a second step we grouped the test locations according to their optic nerve fibre angle into clusters (B). Following a comparison of the sensitivity and stability (specificity) we decided to go for a model with 10 clusters.

**Conclusions**
The polar graph has shown to provide a direct bridge for the comparison of functional with structural data on the optic disc. The cluster graph can replace the comparison map and the probability map by combining both information for the application in glaucoma detection and follow up.

![A) Octopus Polar Graph](image1)

![B) Cluster Graph](image2)
<table>
<thead>
<tr>
<th>Title</th>
<th>Our experience with the new software Octopus Field Analysis OFA</th>
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<tbody>
<tr>
<td>Author</td>
<td>LEFRANCOIS Alain</td>
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<tr>
<td>Co-Authors</td>
<td>VALTOT Françoise, BARRAULT Odile</td>
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<td><strong>Abstract</strong></td>
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<tr>
<td><strong>Purpose</strong></td>
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<td>The software OFA (Octopus Field Analysis) is a new software to evaluate results of the Octopus perimeters. Older results with 30° programs can be used in retrospective analysis and prolonged. The purpose is to show our preliminary conclusions after eighteen months of use with OFA.</td>
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<tr>
<td><strong>Methods</strong></td>
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<td>Two sorts of cases were studied. A) All glaucoma cases with confirmed abnormalities of visual field. B) Preperimetric glaucoma with confirmed FDT (Frequency Doubling Technology) abnormalities.</td>
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<tr>
<td><strong>Results</strong></td>
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<td>The “cluster” analysis is better for diagnosis and survey in all glaucoma cases. In some cases we find good correlation between “visual field –structure” OFA abnormalities and GDX-HRTstructure abnormalities. Unless a lack of significance, some abnormalities are seen before those with the old analysis program in preperimetric glaucoma.</td>
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<tr>
<td><strong>Conclusions</strong></td>
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<td>The new OFA program greatly improves our glaucoma visual field analysis. A good interactivity between functional tests and structure tests showed in the same computer in our desk, is necessary for better analysis.</td>
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Title | Comparison between Octopus and Goldmann kinetic fields  
---|---
Author | Dr Fiona Rowe  
Co-Authors |  
Commercial relations | F, R  
Support if any |  
Keywords | Visual field, Isopter, Peripheral, Central,  
Abstract | **Purpose**  
Goldmann perimetry has been a popular choice for the assessment of visual fields in patients with neurological impairment of the visual pathways, for patients with low vision and in the assessment of young children. Its replacement with the Octopus 900 perimeter has raised the question of reproducibility and reliability of results obtained with the Octopus perimeter in comparison to those obtained with the Goldmann perimeter.  
The purpose of this presentation is to directly compare the results of visual field assessment by both perimeters.  

**Methods**  
26 control subjects (52 eyes) and eight patients (16 eyes) have been prospectively evaluated using the same testing strategy for both Octopus and Goldmann perimetry. Stimulus I4e was used for the peripheral field and blind spot evaluation with stimulus I2e used for central field evaluation. The order of perimeter use was randomised in both the control and patient groups.  
When evaluating the results of the control group the following parameters were assessed: duration of test and area measurement of isopter for 3, 5 and 10 degrees/second stimulus speeds with and without reaction times. Goldmann perimetry was timed at 2-3 degrees/second. When evaluating the results of the patient group the following parameters were assessed: duration of test, reproducibility of field defect and extend of visual field defect.  

**Results**  
The duration of test was found to be significantly quicker when using the Octopus 10 degree/second stimulus speed or when using the Goldmann perimeter in comparison to the Octopus 3 degree/second speed. The area of isopter was underestimated by the Octopus 10 degree/second speed with an overestimation of blind spot size. Goldmann perimetry showed significantly smaller areas of field boundaries compared to the Octopus perimeter results. With increasing age, the test duration was longer with Octopus perimetry and the area of isopter reduced in measurement.  

For the patient group the field defect was most reproducible with the central target stimulus and required additional careful examination with vectors in the peripheral field. Kinetic perimetry requires individual tailoring for the patient’s ability and pattern of visual field loss in order to ensure accuracy.
| **Title** | Semi-automated kinetic perimetry (SKP) – basic principle and impact on traffic ophthalmology, suitability testing and expert opinion |
| **Author** | Ulrich Schiefer¹ |
| **Co-Authors** | J. Paetzold¹, E. Papageorgiou¹² |
| **Commercial relations** | F, I, C |
| **Support if any** | Haag Streit Inc., Koeniz, Switzerland |
| **Keywords** | Semi-automated kinetic perimetry, SKP, visual field defect, expert opinion, ability testing, suitability to drive, traffic ophthalmology, visual exploration |
| **Abstract** | Kinetic perimetry is the method of choice for the delineation of advanced visual field loss particularly that exhibiting a steeply-sloping border such as advanced arcuate loss, altitudinal loss, concentric constriction and hemianopsia. The technique is more efficient for the edge-detection of such defects and therefore less time-consuming and less tiring for both the patient and the perimetrist than automated static perimetry. The outcome of conventional kinetic perimetry with the classic manual Goldmann perimeter is highly dependent upon the experience of the perimetrist and nowadays it is rare to find a technician of the required standard. As a consequence, there is a pressing clinical need for the development of a standardized and automated method of kinetic perimetry.

A novel technique for kinetic perimetry, semi-automated kinetic perimetry (SKP), has been developed for the Octopus 101 and 900 perimeters (Haag-Streit, Koeniz, Switzerland) which permits computer-controlled presentation of the stimulus in any direction over the entire field, at predefined and constant angular velocities, and reduces to a minimum the dependency upon the perimetrist. The start and finish points for the stimulus vector are pre-specified by the perimetrist; the response from the patient is corrected for their individual reaction time (RT, defined as the latency between stimulus presentation and patient response); and the area for any given RT-corrected isopter is automatically calculated by the software.

(Binocular) kinetic perimetry is necessary for expert opinion and for the assessment of the suitability to drive in case of manifest visual field defects in Germany and also in Japan. Further aspects, such as (compensatory) explorative gaze movements will be addressed in this presentation.
How do patients perceive Metamorphopsia under monocular and binocular conditions?

Eiko Arimura

Chota Matsumoto, Hiroki Nomoto, Fumi Tanabe, Shigeki Hashimoto, Sonoko Takada, Sachiko Okuyama, Yoshikazu Shimomura

Purpose
To report how patients with various macular diseases perceived metamorphopsia monocularly and binocularly using Amsler chart and M-charts.

Methods
Forty-four patients with idiopathic epiretinal membrane (ERM), 38 patients with idiopathic macular hole (M-hole), and 17 patients with age-related macular degeneration (AMD) were included. Under monocular and binocular conditions, patient's metamorphopsia was first qualitatively detected by Amsler chart and was subsequently quantified by M-charts that included one straight line and 19 dotted lines with dot intervals between 0.2° to 2.0° visual angles. The minimum visual angle of the dotted line needed for metamorphopsia to disappear was measured and served as patient’s M-charts score. Patient's visual field were evaluated by program M2 of the OCTOPUS 101. Modified Titmus stereo tests were performed on the patients with ERM to determine suppression.

Results
In patients with ERM, the monocular and binocular detection rates were 80% and 27% by Amsler chart, and were 80% and 14% by M-charts, respectively. In patients with M-hole, those were 100% and 18% by Amsler chart, and were 100% and 34% by M-charts, respectively. In patients with AMD, those were 100% and 41% by Amsler chart, and were 89% and 29% by M-charts, respectively. In those affected eyes with an M-charts score less than 0.5, patients with ERM or M-hole did not perceive metamorphopsia binocularly. In those affected eyes with an M-charts score larger than 1.0, the sensitivities for detecting metamorphopsia binocularly in patients with ERM, M-hole, and AMD were 23%, 43%, and 60%, respectively. Suppression was observed in 53% of the patients with ERM.

Conclusions
Depending on the severity of metamorphopsia and the disease type, even patients with unilateral macular disease could perceive metamorphopsia binocularly. Therefore, both monocular and binocular perceptions of metamorphopsia are useful indices of the QOV of patients with macular diseases.
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<tr>
<th>Title</th>
<th>Understanding the Basis of the Relative Afferent Pupillary Defect</th>
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<td>Author</td>
<td>Aki Kawasaki</td>
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<td>Co-Authors</td>
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<td>Keywords</td>
<td>Pupil, RAPD, Melanopsin</td>
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<tr>
<td>Abstract</td>
<td><strong>Purpose</strong>&lt;br&gt;Pupil responses that differ as a function of light intensity and wavelength can reflect phototransduction mediated by either rods, cones, or intrinsic activation of melanopsin-expressing retinal ganglion cells. This talk will review the different sources of retinal input to the pupil light reflex and discuss their implications on our understanding of the significance of the relative afferent pupil defect (RAPD) and its correlation to visual loss in the clinical setting.</td>
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<td><strong>Methods</strong>&lt;br&gt;43 normal eyes were tested by recording the pupil light reflex to a Ganzfeld red (620nm +/- 20nm) and blue (480nm +/- 20nm) light stimulus at 3 light intensities (1, 10, and 100 cd/m2) under mesopic conditions. The pupil responses of the normal subjects were compared to patients with unilateral optic nerve damage.</td>
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<td><strong>Results</strong>&lt;br&gt;In normal eyes at lower intensities, blue light evoked much greater pupil responses compared to red light when matched for photopic luminance. The transient and sustained pupil contractions showed greatest disparit at the lowest light intensity and decreased with increasing light intensity. Patients with optic neuropathy showed relative loss of pupil responses to chromatic light in the affected eye, i.e. an RAPD was present. However, the pattern of loss of pupil responses was varied; sometimes generalized and othertimes selective for blue or red light.</td>
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<td><strong>Conclusions</strong>&lt;br&gt;The RAPD remains a valuable clinical indicator in the detection and evaluation of neuroretinal diseases that cause visual loss. Chromatic pupil responses can provide more specific information about the source of retinal input (outer photoreceptors vs melanopsin) to the pupil light reflex, and use of colored lights to determine and quantify the RAPD may be useful to better differentiate diseases affecting either the outer or inner retina.</td>
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Gonio-Imaging using the CGAL Contact Lens

Tarek Shaarawy¹, Steve Thomson²
¹Department of Ophthalmology University of Geneva Switzerland, ²Haag-Streit AG Koeniz, Switzerland

Gonio-Imaging is one of the most challenging missions in Ophthalmic Photography. The commonly used Goldman 3-mirror lens was designed for general use in ophthalmic examination and many skilled photographers have produced wonderful images of the anterior eye and iridocorneal angle.

Why is the CGAL better for Gonio-Imaging?

The magnification factor of 1.5x obtained with the CGAL allows the slit lamp to be used at a lower magnification and therefore the depth of field is increased.

16x with a 3-mirror produces a DOF of 0.5mm the equivalent image can be obtained at 10x with the CGAL and the depth of field improves to 1.4mm.

The CGAL (Rousset & Fankhouser) was conceived primarily to enhance laser treatment in the anterior chamber but many of the design features also improve its imaging ability over that of the 3-mirror.

**The Goldman 3-Mirror**

- Almost optically neutral
- 3 mirrors
- 1 optical zone
- Non coated
- Acrylic glass

**Designed to facilitate viewing of the complete eye using a slit lamp**

**The CGAL**

Optimised to provide the best view of the angle and make most efficient use of laser energy

- Optical Magnification 1.5x
- Anti-reflection coating
- 55-degree mirror
- Mineral glass
- Large Mirror
- Improved optics

The large single mirror of the CGAL is almost three times the area of the regular 3-mirror and therefore less re-positioning is required to get the desired view when compared to the small gonio mirror of the Goldman design.
<table>
<thead>
<tr>
<th><strong>Title</strong></th>
<th>Digital Documentation of Slit Lamp Examinations</th>
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<tbody>
<tr>
<td><strong>Author</strong></td>
<td>Christopher Mody</td>
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<tr>
<td><strong>Co-Authors</strong></td>
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<td><strong>Commercial relations</strong></td>
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<td>R - honoraria and travel reimbursement</td>
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**Purpose**
To provide the audience with an overview of current anterior segment imaging techniques including external clinical photography, slit lamp imaging, specula microscopy, Anterior segment angiography and OCT imaging.

**Methods**
Through a sequence of cases discuss the application anterior segment imaging, with particular reference to slit lamp imaging and illumination technique. Describe a systematic approach slit lamp photography providing the audience with a foundation knowledge base to apply within their own clinical practice.
<table>
<thead>
<tr>
<th><strong>Title</strong></th>
<th>A novel biometry measuring device: Accuracy and clinical applications</th>
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<tr>
<td><strong>Author</strong></td>
<td>Mike P. Holzer</td>
</tr>
<tr>
<td><strong>Co-Authors</strong></td>
<td>Mamusa M., Ehmer A., Jepsen C, Hildebrandt L, Rabsilber T.M., Auffarth, G.U.</td>
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<tr>
<td><strong>Commercial relations</strong></td>
<td>International Vision Correction Research Centre (IVCRC), University of Heidelberg, Department of Ophthalmology, INF 400, 69120 Heidelberg, Germany</td>
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| **Abstract** | **Objective**  
To investigate a new biometry measuring device (Lenstar LS 900®, Haag Streit AG) and compare the results as well as clinical applications to those of the IOLMaster (Carl Zeiss Meditec AG).  

**Methods**  
Five consecutive measurements of both eyes (n=200) of 100 healthy phakic volunteers (mean age 27.25 ± 10.32 years) with different refractive status as well as 100 eyes of 100 cataract patients (mean patient age: 70 ± 10.6 years) were performed with a new non-contact optical coherence biometry measuring device (Lenstar LS 900®, Haag Streit AG) and the IOLMaster. Data evaluated included keratometry, axial length, anterior chamber depth as well as intraocular lens calculations based on these measurements.  

**Results**  
Axial length and keratometry measurements showed a very high correlation coefficient of 0.99 (Spearman), anterior chamber depth (ACD) however, was lower. Also the standard deviation for ACD was lower with the new biometry device when compared to the IOLMaster (0.26 mm vs. 0.42 mm) in the group of healthy volunteers.  

**Conclusions**  
The new biometry measuring device revealed precise and valid data when compared to the IOLMaster and can be used for patient work up of cataract as well as refractive surgery patients and routine clinical exams.
Abstract

**Purpose**
To evaluate and compare axial length (AL), anterior chamber depth (ACD), and central corneal thickness (CCT) measurements assessed by the IOLMaster (Zeiss) Pachymeter (Haag-Streit), and by a new functional prototype applying optical low coherence reflectometry biometry Lenstar (Haag-Streit).

**Methods**
Lenstar, Pachymeter and IOLMaster measurements were performed in 144 eyes of 80 patients with cataractous, pseudophakic, aphakic, silicon-oil filled or normal eyes. Among the patients were 34 men. There were no exclusion criteria. Bland-Altman analysis was performed to investigate agreement of AL, ACD, and CCT measurements between the devices. Correlation between the techniques was also determined using linear regression. All measurements were performed according to the manufacturers recommendations.

**Results**
The mean AL was for Lenstar 24.1 mm, IOLMaster 24.1 mm; the mean ACD for Lenstar 3.19 mm, IOLMaster 3.17 mm; the mean CCT for Lenstar 0.557 mm, Pachymeter 0.557 mm. Bland-Altman analysis and linear regression showed high correlation between the devices.

**Conclusion**
Lenstar, IOLMaster and Pachymeter give comparable results in all kinds of patients or controls. The advantages of the Lenstar are the non contact method, the exact measurement of AL, ACD, LT and CCT on the same interferometry method and hence the short duration of the measurements.
**Title**
Evaluation of Structural and Functional Changes in Glaucoma Using Polar Diagram

**Author**
Fumi Tanabe

**Co-Authors**
Eiko Arimura, Chota Matsumoto, Sachiko Okuyama, Sonoko Takada, Hiroki Nomoto, Shigeki Hashimoto, Yoshikazu Shimomura

**Commercial relations**

**Support if any**

**Keywords**
Polar diagram, Octopus, glaucoma

**Abstract**

**Purpose**
To investigate the clinical usefulness of the polar diagram, a new visual field analyzing software, in patients with open angle glaucoma (OAG).

**Methods**
Subjects were 40 eyes of 40 patients with OAG. All eyes were tested by normal strategy using program G2 of the Octopus 101, and all visual fields were analyzed by Octopus Field Analysis. We divided the polar diagram map into 12 areas that matched the nerve fiber layer thickness (NFLT) measurements by OCT. We then compared each of the 12 areas with the stereo fundus photographs and with the 12 clock-hour sectors of NFLT measured by Strauss OCT.

**Results**
The abnormal areas detected by the polar diagram correlated well with those shown in the stereo fundus photographs. The abnormal areas by the polar diagram and the 12 clock-hour sectors of NFLT also correlated in 76%, 75%, and 71% of patients with early, moderate, and advanced stage of OAG, respectively.

**Conclusions**
The polar diagram is a useful tool for evaluating the correspondence between the structural changes of the optic disc and the functional changes of the visual field in patients with OAG.
When using static perimetry to screen patients for visual field impairment, it is not uncommon to utilise a fast perimetry programme. When performing a follow-up assessment, particularly for a patient with known visual field impairment, a more detailed programme is chosen. Both Octopus and Humphrey perimeters offer strategies for threshold static perimetry that vary in time demands for duration of test. The purpose of this presentation is to compare a small case series of patients requiring central static visual field assessment.

Patients were prospectively recruited who were glaucoma suspects, who had a diagnosis of ocular hypertension or a diagnosis of primary open angle glaucoma. They underwent assessment with both Octopus and Humphrey perimetry within the same clinic session and the order of perimeter assessment was randomised. Screening perimetry was undertaken using the Octopus G TOP programme and Humphrey 24-2 sita fast programme. Full perimetry was undertaken using the Octopus G dynamic programme and Humphrey 24-2 sita standard programme.

27 patients were assessed (49 eyes). The presentation will evaluate greyscale results, decibel values and probability comparisons. Patterns of visual field impairment were found to be reproducible across the varying perimeter programmes.
Title  
Comparison Of A Fast Strategy (TOP) with a Modified Full Threshold Strategy (Dynamic)

Author  
Dr N R Rangaraj MS

Co-Authors  
Dr Bridgitte Akila MSc

Commercial relations  
N

Support if any  
N

Keywords  
TOP, Dynamic

Abstract  

Purpose  
The objective of this study was to compare the visual field defects of the modified full threshold strategy (Dynamic) and a fast strategy, the Tendency Oriented Perimetry (TOP) in glaucomatous patients.

Methods  
This was a prospective study where two tests using TOP and Dynamic strategies were performed on 25 eyes from 18 glaucomatous patients with visual field defects after obtaining verbal informed consent. The two tests were administered to the patients without providing them any details regarding the tests in order to avoid bias in the visual field testing. The decision on the choice of the first strategy was random and both the tests were administered on the same day. The Mean Sensitivity (MS), Mean Deviation (MD), Loss Variance (LV), the number of questions and the test duration were compared between TOP and dynamic strategies.

Results  
The age of the patients ranged from 35 yrs to 79 yr, there were 12 females and 6 males. The number of questions was significantly lower for TOP strategy than the Dynamic strategy and the difference in the number of questions was statistically significant (Wilcoxon signed rank test, \( p<0.001 \)). Similarly, the test duration was also significantly lower for TOP strategy than the Dynamic strategy and the difference in test duration was statistically significant (Wilcoxon signed rank test, \( p<0.001 \)). However, there was no significant difference in major indices of MS, MD and LV of the two strategies. Though the median values of LV in both strategies was the same the average values of the index was lower in TOP strategy compared with higher values in Dynamic strategy.

Conclusions  
Less time duration and lower number of questions makes TOP very useful and can be recommended in patients with consistently low reliability factor with other strategies and in neurological conditions. Dynamic strategy may detect early defect since the average values of LV are higher than TOP which may be used for routine clinical follow up of established cases of glaucomatous field defects.

<p>| Table 1. Descriptive statistics of Visual Field Indices |
|---------------------------------|----------------|----------------|</p>
<table>
<thead>
<tr>
<th>Visual field indices</th>
<th>TOP strategy (n=25)</th>
<th>Dynamic strategy (n=25)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Mean Sensitivity (MS)</td>
<td>19.25 (5.8)</td>
<td>18.81 (6.2)</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>19.5</td>
<td>20.7</td>
</tr>
<tr>
<td>Median</td>
<td>6.6, 27.9</td>
<td>4.1, 26.1</td>
</tr>
<tr>
<td>Min, Max</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II. Mean Defect (MD)</td>
<td>7.78 (5.4)</td>
<td>10.21 (10.7)</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>7.8</td>
<td>7.5</td>
</tr>
<tr>
<td>Median</td>
<td>-0.4, 20.1</td>
<td>0.9, 53</td>
</tr>
<tr>
<td>Min, Max</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III. Loss Variance (LV)</td>
<td>42.65 (32.6)</td>
<td>62.2 (47.9)</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>38.1</td>
<td>39.8</td>
</tr>
<tr>
<td>Median</td>
<td>3.4, 115.3</td>
<td>8.5, 161.3</td>
</tr>
<tr>
<td>Min, Max</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Title
TOP and Pulsar fluctuation

### Author
Manuel Gonzalez de la Rosa

### Co-Authors
Marta Gonzalez-Hernandez

### Commercial relations
P

### Support if any

### Keywords
Automated perimetry, glaucoma, fluctuation, Tendency Oriented Perimetry, Pulsar.

### Abstract

**Purpose**
To show the results of research on both Tendency Oriented Perimetry and Pulsar’s perimeter fluctuations as well as new ideas to stabilize perimetric results.

**Methods**
Review of some of the publications about TOP strategy and Pulsar perimetry and some non published results. Hypothesis explaining Pulsar’s stability based on research carried out during its design. New ideas to improve perimetric stability: mathematic threshold filtering and use of the Bebie curve.

**Results and Conclusions**
Fast strategies which take into account the dependence relations between close points are more stable. Pulsar is more stable than TOP-WW and FDT probably due to stimulus size and duration and the method of determining the threshold. Lowest Pulsar fluctuation coincides with bigger range of results indicating early and advanced defects. Mathematic filtering the thresholds, facilitates the assessment of progression without reducing sensitivity and increasing specificity. This way long term fluctuation for Pulsar of only 0.7 src units (equivalent to dB on WW perimetry) is achieved.

![Figure 1](image1.png)
**Figure 1**
Test-retest fluctuation for FDT, TOP-WW and Pulsar (1303 examinations, 85998 pairs of thresholds, 162 patients) and additional reduction when filtering Pulsar’s data and using the defect curve.

![Figure 2](image2.png)
**Figure 2**
Range of the results of the same sample (Percentil 95% - Percentil 5%)
Title | Detectability of glaucomatous functional and structural changes
--- | ---
Author | Hiroki Nomoto
Co-Authors | Chota Matsumoto, Sachiko Okuyama, Sonoko Takada, Shigeki Hashimoto, Eiko Arimura, Fumi Tanabe, Yoshikazu Shimomura
Commercial relations | N
Support if any | None
Keywords | Flicker perimetry, FDT, SWAP, OCT, NTG, POAG

Abstract

**Purpose**
To compare the detectability of glaucomatous functional and structural changes and to investigate the difference in visual field results between NTG patients with IOP < 21mmHg and HTG patients with IOP > 21mmHg by SAP, FDT, flicker perimetry, SWAP, and OCT.

**Methods**
Subjects were glaucoma suspects (GS) and patients with glaucoma, including NTG and HTG. All subjects underwent HFA 24-2 full threshold (SAP), SITA-SWAP, FDT (30-1, 30-5, 24-2-1, 24-2-5), flicker perimetry on Octopus 311 (4-zone probability 38S), and Stratus OCT (fast RNFL thickness). To evaluate the visual field, FDT and flicker used the number of abnormal points (NAP), while SAP used mean deviation (MD) and SWAP used both NAP and MD. The areas under the receiver operating characteristic curves (AUCs) and sensitivities at fixed specificities were used to assess the detectability of glaucoma. Spearman Rank-Order Correlation Coefficient evaluated the differences of visual field results in patients with NTG and HTG.

**Results**
The AUCs for FDT 30-1, 30-5, 24-2-1, 24-2-5, flicker perimetry, SWAP (MD), SWAP (NAP) were 0.95, 0.94, 0.88, 0.89, 0.99, 0.88 and 0.88 in the patients with early glaucoma; and 0.67, 0.69, 0.65, 0.70, 0.80, 0.64 and 0.66 in the GS, respectively. Average NFLT was seen significantly correlated to the MD of HFA and to the NAP in HFA, FDT, flicker, and SWAP in all glaucoma patients. The NTG and HTG patients did not differ significantly in their visual field results and NFLT. The patients with early glaucoma and GS indicated a significant correlation between the inferior average NFLT and the NAP in the upper hemifield in HFA, FDT, flicker, and SWAP. However, no significant difference of correlation with NFLT and visual field results was found between the NTG and HTG patients.

**Conclusions**
FDT, SWAP, flicker perimetry and OCT are all useful methods to discriminate between healthy eyes and eyes with early glaucoma. Our results showed that these methods demonstrate equivalent detectability of early glaucomatous visual field loss for age-, axis- and NFLT-matched NTG and HTG patients.
<table>
<thead>
<tr>
<th>Title</th>
<th>Detection of Local Visual Field Loss Progression in Patients with Diffuse Improvement using Cluster Trends Analysis in Octopus Field Analysis (OFA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Author</td>
<td>Sachiko Okuyama</td>
</tr>
<tr>
<td>Co-Authors</td>
<td>Sonoko Takada, Chota Matsumoto, Eiko Arimura, Shigeki Hashimoto, Hiroki Nomoto, Fumi Tanabe, Yoshikazu Shimomura</td>
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<tr>
<td>Commercial relations</td>
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<td>Support if any</td>
<td></td>
</tr>
<tr>
<td>Keywords</td>
<td>local progression, learning effect, cluster trends analysis, glaucoma</td>
</tr>
</tbody>
</table>
| Abstract | **Purpose**  
To detect the local visual field (VF) loss progression in patients with diffuse improvement, such as long term learning effect, using cluster trends analysis.

**Methods**  
One hundred and fifty three follow-up series of the reliable VF test results using Octopus program G2 normal strategy in each eye with open angle glaucoma (OAG), OAG suspect or ocular hypertension (OH) were included. The initial examination in each eye or the examinations with more than 15% of false positive responses or more than 20% of false negative responses were excluded. Each VF series included 6 or more test results (mean number of examinations: 8.2). Their follow-up periods were 5 years or longer (mean: 7.0 years). Mean defect (MD) of the initial examination of each VF series ranged between -2.9 and 14.6 dB (mean: 3.0 dB, SD 3.2 dB). The trends of the global visual field indices, the absolute and the shift-corrected cluster defects in each cluster of G2 test points were analyzed by OFA version 2.2.

**Results**  
MD slope by linear regression of each VF series ranged from -0.9 to 1.0 dB/year (mean and median: 0.0 dB/year, negative slope: deterioration, positive slope: improvement). Fourteen eyes (9%) showed statistically significant MD improvement (range: 0.2 - 1.0 dB/year, p<0.05, two-sided). The main factor of MD improvement of theses cases was the improvement of diffuse defect. Five eyes (3%) in 7 OAG eyes with significant MD improvement had one or two significantly deteriorating clusters based on the shift-corrected defects, and only one eye of them had one significantly deteriorating cluster based on the absolute defects (p<0.05, two-sided).

**Conclusions**  
It is not unusual to detect long term MD improvement in cases with early OAG, OAG suspect and OH. It is suspected that cluster trends analysis based on shift-corrected defects is effective to detect local VF deterioration in such cases with MD improvement.
<table>
<thead>
<tr>
<th>Title</th>
<th>Rates of Progression in Glaucoma</th>
</tr>
</thead>
</table>
| Author | Paul H Artes, PhD  
Associate Professor and Foundation Scholar in Glaucoma Research  
Ophthalmology and Visual Sciences, Dalhousie University  
Halifax, Nova Scotia, Canada |
<p>| Co-Authors | |
| Commercial relations | |
| Support if any | |
| Keywords | |
| Abstract | Most clinical studies in glaucoma have reported on the incidence of progression (ie, how many patients show a certain amount of change). In clinical practice, however, what matters most is an individual patient’s rate of progression, ie the speed at which they deteriorate. This rate determines how closely the patient needs to be followed, and how aggressively they need to be treated, to reduce their risk of disability. This talk examines what recent clinical studies have taught us about rates of progression in treated and untreated patients with glaucoma, and why the “average” rates of progression in these studies differ. We will review how rates of progression can be estimated in day-to-day practice, what pitfalls clinicians might encounter, and what strategies can be employed to identify the small but important group of patients at risk of disability from rapid progression of glaucoma. |</p>
<table>
<thead>
<tr>
<th>Title</th>
<th>Assessing the global and regional Progression Rate</th>
</tr>
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<tbody>
<tr>
<td>Author</td>
<td>Matthias Monhart</td>
</tr>
<tr>
<td>Co-Authors</td>
<td>Hans Bebie, Ernst Bürki</td>
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<td>Support if any</td>
<td>Haag-Streit AG</td>
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<tr>
<td>Keywords</td>
<td>Progression rate, change probability, cluster analysis</td>
</tr>
<tr>
<td>Abstract</td>
<td><strong>Purpose</strong></td>
</tr>
<tr>
<td></td>
<td>To explain the application of the progression rate concept in different trend analysis software.</td>
</tr>
<tr>
<td></td>
<td><strong>Methods</strong></td>
</tr>
<tr>
<td></td>
<td>PeriTrend, PeriData, Humphrey GPA and EyeSuite Perimetry are used to identify the progression rate and further important parameters in the judgment of progression.</td>
</tr>
<tr>
<td></td>
<td><strong>Results</strong></td>
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<tr>
<td></td>
<td>The progression rate concept is easily adopted to different visual field trend analysis software solutions. However, not all software provide the same level of information.</td>
</tr>
<tr>
<td></td>
<td><strong>Conclusions</strong></td>
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<tr>
<td></td>
<td>Depending on the individual visual field sequence, a different number of tests is required to receive the progression rate with a desired confidence interval. In visual fields with predominantly local defects, the regional (cluster-) trend may help to identify more rapidly progressing areas.</td>
</tr>
<tr>
<td><strong>Title</strong></td>
<td>Experience with the short test duration TOP strategy</td>
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<tr>
<td><strong>Author</strong></td>
<td>Ana M. Fernández-Vidal, presented by Dr. Federico Sáenz-Francés</td>
</tr>
<tr>
<td><strong>Co-Authors</strong></td>
<td>Manuel González de la Rosa, Carmen Méndez-Hernández, Julián García-Feijoó</td>
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<td><strong>Commercial relations</strong></td>
<td>NONE</td>
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<td><strong>Support if any</strong></td>
<td></td>
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<tr>
<td><strong>Keywords</strong></td>
<td>TOP, automated perimetry, glaucoma.</td>
</tr>
</tbody>
</table>

**Abstract**

**Purpose**
To determine the advantages of the short test duration TOP strategy for automatic perimetry evaluation.

**Methods**
Review of some of the publications about TOP strategy in relation with other short test strategies to determine its advantages and disadvantages as well as exploring its possible applications and uses other than glaucoma.

**Results and Conclusions**
We believe that TOP strategy is a useful and specific method which enables time-saving when exploring a patient with an automatic perimetry.
The purpose of this presentation is to present clinical test that can help in the diagnosis and follow up of visual complaints.

Clinical case-presentations will show how adjunct non-invasive testing can help verify a patient’s complaints and aid in making the diagnosis or can alternatively unmask presented complaints as functional. Particular emphasis is placed on the use of the multifocal ERG, a non-invasive test which provides objective information on central retinal function. Combining functional non-invasive tests such as visual fields, the mfERG and other electrophysiological tests with morphological non-invasive tests such as the OCT and autofluorescence imaging we have powerful tools to differentiate retinal from optic nerve disease or functional disorders.
**Saturday November 1**

<table>
<thead>
<tr>
<th>Title</th>
<th>Visual function specific perimetric tests and structural changes in early and preperimetric glaucoma</th>
</tr>
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<tbody>
<tr>
<td>Author</td>
<td>Chota Matsumoto</td>
</tr>
<tr>
<td>Co-Authors</td>
<td>H. Nomoto, S. Okuyama, S. Takada, S. Hashimoto, E. Arimura, F. Tanabe and Y. Shimomura</td>
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<tr>
<td>Commercial relations</td>
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<td>Support if any</td>
<td>N</td>
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<tr>
<td>Keywords</td>
<td>FDT, FLICKER, SWAP, OCT, PREPERIMETRIC GLAUCOMA</td>
</tr>
</tbody>
</table>
| Abstract | **Purpose**  
The agreement of the functional changes and the structure changes is a strong proof for glaucoma diagnosis. However, the relationship between visual function specific perimetric tests such as FDT, Flicker, SWAP and structural changes are still unknown, especially in preperimetric glaucoma. We evaluate the relationship between the abnormalities found by SAP, Matrix, flicker perimetry, SWAP at each test location and the 12 clock-hour sectors of retinal nerve fiber layer thickness (NFLT) measured by OCT in early and preperimetric glaucoma.  

**Methods**  
Subjects were 30 eyes of 30 preperimetric glaucoma and 27 eyes of 27 early glaucoma patients. All subjects underwent HFA 24-2 full threshold (SAP), Matrix (24-2-5), flicker perimetry (4-zone 38S), SITA-SWAP (24-2), and OCT (fast RNFL thickness). The relationship between visual field abnormality at each test point, sectors and their NFLT at each 12 clock-hour sector were investigated.

**Results**  
In early glaucoma patients, there were significant relationships between abnormal test locations obtained by SAP, Matrix, Flicker, SITA-SWAP and anatomically-corresponded RNFL sectors by OCT. Matrix, flicker perimetry, and SWAP showed more locations related to the RNFL sectors than SAP. In preperimetric glaucoma patients, there were also significant relationships between abnormal test locations using Matrix, Flicker, SITA-SWAP and anatomically-corresponded RNFL sectors obtained by OCT.

**Conclusions**  
Early functional changes detected by Matrix, flicker perimetry and SWAP relate to the anatomically-corresponded structural changes in early and preperimetric glaucoma.
<table>
<thead>
<tr>
<th>Title</th>
<th>Is there a learning effect in CFF perimetry?</th>
</tr>
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<tbody>
<tr>
<td>Author</td>
<td>Knut Luraas</td>
</tr>
<tr>
<td>Co-Authors</td>
<td>H. Hafskolt, E. Holmberg, J.M. Wild</td>
</tr>
<tr>
<td>Commercial relations</td>
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<td>Support if any</td>
<td>None</td>
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<tr>
<td>Keywords</td>
<td>CFF perimetry, learning effect</td>
</tr>
</tbody>
</table>

### Abstract

**Purpose**

To determine the learning effect for CFF perimetry in normal individuals naïve to both Standard Automated Perimetry (SAP) and CFF Perimetry and in individuals with either ocular hypertension (OHT) or open angle glaucoma (OAG) and experienced in SAP but naïve to CFF Perimetry.

**Methods**

The cohort comprised 48 age-matched individuals (28 normal individuals [mean age 62.46 years SD 8.7] naïve to both SAP and CFF Perimetry, 9 individuals with OHT [mean age 63.6 years SD 9.6] naïve to CFF Perimetry and normal visual fields to SAP and 11 individuals with OAG [mean age 66.3 years SD 6.6] exhibiting glaucomatous visual field loss to SAP). All individuals underwent a clinical examination at baseline including SAP using Program G1 and the Dynamic strategy of the Octopus 311. After an interval of two weeks, they underwent CFF perimetry in each eye on five occasions each separated by one week using Program G1 and the TOP algorithm. The results were analysed over the five visits in terms of the absolute values of the Mean Defect (MD) and of the Loss Variance (LV) and in terms of the proportionate change in each index from the first to each of the succeeding four visits.

**Results**

Large between-individual variation in performance was present within and between all three diagnostic groups. In terms of Group statistics, the normal individuals and the individuals with OHT exhibited an improvement in MD in both eyes up to Visit 5 based upon the median proportionate change. The individuals with OAG showed little alteration in either MD or LV.

**Conclusions**

A diversity of performance within- and between groups was present over the five visits. The between-individual variation in performance will not facilitate the interpretation of field loss by CFF perimetry. The data suggests that, in general, CFF perimetry is a too difficult a task to be clinically viable.
<table>
<thead>
<tr>
<th>Title</th>
<th>The effect of defocus on the Pulsar stimulus in normal individuals and in patients with open angle glaucoma (OAG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Author</td>
<td>C. A. Castelberg</td>
</tr>
<tr>
<td>Co-Authors</td>
<td>M. Zulauf, J. M. Wild</td>
</tr>
<tr>
<td>Commercial relations</td>
<td>none</td>
</tr>
<tr>
<td>Support if any</td>
<td>Haag-Streit AG provided the Pulsar perimeter. No financial support was received from any company or agency.</td>
</tr>
<tr>
<td>Keywords</td>
<td>Pulsar perimetry, defocus</td>
</tr>
</tbody>
</table>
| Abstract      | **Purpose**  
To determine the effect of defocus for Pulsar perimetry in normal individuals naïve to perimetry and in individuals with open angle glaucoma (OAG) who were experienced in Standard Automated Perimetry (SAP).  

**Methods**  
Thirty-one individuals (17 normal individuals and 14 with OAG) attended for perimetry on 5 occasions, each separated by one week. At each visit, each individual was examined in one designated eye with Program 24-2 and the SITA Standard algorithm of the Humphrey Field Analyzer 745i (Carl Zeiss Meditec, Dublin, Ca) and four times with Program CP-T30W and the TOP algorithm of the Pulsar perimeter (once at each of 4 different levels of defocus: plano, +2.00DS, +4.00DS and +6.00DS). The order of the program within the visit and the order of defocus for the Pulsar perimeter were randomized within individuals and were varied over each of the five visits. Analysis of the various visual field indices was undertaken using separate repeated measures ANOVAs.  

**Results**  
The MD (p < 0.001) and the square root of the LV (p < 0.001) deteriorated with increase in defocus. At Visit 5, the reduction in Mean Sensitivity with defocus for the normal individuals was 1.5dB per diopitre of defocus.  

**Conclusions**  
Pulsar perimetry should be undertaken with the optimum refractive correction for the viewing distance of the instrument.
Abstract

Purpose
To determine the characteristics of any learning effect associated with Pulsar perimetry.

Methods
The cohort comprised 25 normal individuals naïve to any form of perimetry, 26 individuals with ocular hypertension (OHT) experienced in standard automated perimetry (SAP) and 27 individuals with open angle glaucoma (OAG) experienced in SAP. Each individual attended for five visits each separated by one week. At each visit, each individual was examined with Program T30W and the TOP algorithm of the Pulsar Perimeter and with Program 24-2 and the SITA Standard algorithm of the Humphrey Field Analyzer 745i (Carl Zeiss Meditec, Dublin, Ca). The order of algorithm was randomized for each individual within- and between-visits. The results for the various visual field indices were analyzed using separate repeated measures ANOVAs.

Results
As would be expected, the Mean Deviation/ Mean Defect differed between the three diagnostic groups (p<0.001). It was more severe for Pulsar perimetry (p<0.001) and, as would be expected, was less severe with increase in previous experience of SAP (p=0.007). It remained clinically stable over the five visits (p=0.232) in each eye (p=0.723) across the three groups (p=0.937) regardless of the type of perimetry (p=0.453) and of the diagnostic group (p=0.937). Similarly, the Pattern Standard Deviation/ SQRT Loss Variance differed between the three groups (p<0.001) but remained stable over the five visits (p=0.684) in each eye (p=0.550) regardless of the type of perimetry (p=0.834) and of the diagnostic group (p=0.997).

Conclusions
There was no learning effect for Pulsar Perimetry in normal individuals naïve to SAP and in individuals with either OHT or OAG and experienced in SAP.
Title
Conventional W/W-Perimetry (Octopus 1-2-3) and Flicker Fusion Perimetry (Pulsar): Indices for the Glaucomatous Visual Field in Comparison

Author
Wiebke Ehrhorn

Co-Authors
None

Commercial relations
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Support if any
Prof. Dr. F. Dannheim, M. Monhart

Keywords
Glaucoma, visual field, perimetry, visual field indices, defect patterns

Abstract
Purpose
Evaluation of Mean Deviation, Index for the Nasal Step and Conformity Index of conventional W/W-Perimetry on Octopus 1-2-3 and Flicker Fusion Perimetry on Pulsar Perimeter in subjects with open angle glaucoma.

Methods
121 eyes from 121 subjects, classified into eight pathological diagnostic levels of open angle glaucoma, were examined using Octopus 1-2-3 Perimeter with TOP-strategy and G1X stimulus pattern as well as Pulsar Perimeter with T30W examination program. Each subject was examined at least three times over a time period of half a year minimum. The last simultaneous examinations on both perimeters of one of the subjects randomly chosen eyes are analysed.

Results
Eyes of worse diagnostic levels were found to have a higher MD than those with early forms of glaucoma. A significant difference was found for MD between W/W-Perimetry and Pulsar Perimeter with values of (2.78 ± 5.94) dB and (4.12 ± 6.31) src. The same relationship was found for the hemi fields. Through examining the defect patterns in varying hemi fields, the Pulsar results proofed its plausibility. The Index of the Nasal Steps has for W/W-Perimetry and Pulsar the same validity in the recognition of a person’s glaucomatous level. The Conformity Index shows better expressiveness for W/W-Perimetry than for Pulsar. The distribution of stimuli on Pulsar Perimeter is disadvantageous in comparison the G1X pattern.

Conclusions
Despite its for glaucoma unfavourable stimulus pattern Pulsar Perimeter is able to detect changes in the visual field, especially in classical glaucomatous areas, early and noticeable. Evaluation of the visual field with the help of the Index for the Nasal Step is also possible for Pulsar Perimeter.
Title: Progression analysis of glaucoma using several morphological and functional criteria

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Co-Authors: Ricardo Rodriguez de la Vega, Marta Gonzalez-Hernandez

Commercial relations: P


Keywords: Automated perimetry, glaucoma, progression, Tendency Oriented Perimetry, Pulsar.

Abstract:

**Purpose**
To review of the procedures for glaucoma visual field progression analysis. To observe the follow up results of functional and morphological data on a sample of patients with early, moderate and suspected glaucoma.

**Methods**
156 eyes were examined every three months for an average of 4 years with HRT II, GDx, FDT, Pulsar and TOP-SAP perimetry.

**Results and Conclusions**
TNT (Threshold Noiseless Trend) is a procedure to analyze SAP and Pulsar visual fields with more than twice the diagnostic ability of other methods. The maximum diagnostic sensitivity was obtained with TNT-Pulsar which presented the smaller amount of cases with visual field improvement due to chance or learning effect. The diagnostic coincidence between different methods was low, but higher between SAP and Pulsar than between morphological procedures. Most of the progressions on initial glaucomas were diffuse, focal progressions showed up on more advanced phases of the disease. Most diagnostic procedures and experts ignore diffuse progression, thinking it is due to cataracts.

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**Figure 1**
Percentage of progression diagnosis as a function of the number of examinations and using different indices and methods of diagnosis.

**Figure 2**
Focality index (FI) of progression as a function of the initial Mean Defect (MD) of the case.
Title: Display of follow-up in glaucoma combining perimetry and disc analysis in a three-dimensional plot

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Co-Authors:

Commercial relations: N

Support if any:

Keywords: Computer perimetry, visual field analysis, optic disc analysis, HRT, glaucoma follow-up

Abstract

Purpose
A combined visualisation of trend analysis of the visual field, separating diffuse from local damage, with trend analysis of the optic disc in glaucoma.

Methods
We applied a modified Brusini chart, a 2-dimensional display of the pure diffuse (x-axis) and the pure local component (y-axis), to serial glaucomatous visual fields, obtained with program G1X on an OCTOPUS 1-2-3 perimeter with a white on white TOP strategy. Morphometric data were derived from HRT 3 measurements.

Results
Serial analysis of diffuse and local visual field damage is facilitated by a displacement of the modified Brusini chart in the direction of the x-axis on a time scale according to the time span since the first test for each follow-up examination. This presentation allows visualisation of long term fluctuation and of trends for the two distinct perimetric components. The status of the optic disc over time may be superimposed to this functional plot using a color coded scale of values of the discriminant function SFM in the z-axis for each available examination. In 3 examples, trends for functional and morphometric parameters are demonstrated which may or may nor run parallel to one other.

Conclusions
A combined display of functional and morphometric serial analysis data may illustrate the correlation of the two in a single three-dimensional plot.
<table>
<thead>
<tr>
<th>Title</th>
<th>The Evaluation of Fully Automated Kinetic Perimetry (Program K) by comparing it to Semi-Automated Kinetic Perimetry (SKP) in patients with visual field loss.</th>
</tr>
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</table>
| Author | Shigeki Hashimoto  
Department of Ophthalmology, Kinki University School of Medicine, Osaka, Japan |
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| Commercial relations | |
| Support if any | |
| Keywords | Program K, SKP, Visual Field |
| Abstract | Purpose  
To quantitatively compare the results obtained using a semi-automated kinetic perimetry (SKP) with those obtained using a fully automated kinetic perimetry (AKP=Program K) in patients with visual field (VF) loss.  
Methods  
Twenty-three patients (13 eyes suffering from glaucoma, 5 eyes from retinitis pigmentosa, and 5 eyes from neuro-ophthalmological disease, with an average age of 60.2±15.4 yrs) were included in this study. One eye of each patient was examined using SKP and Program K. VF loss was assessed by using the following stimulus characteristics: V/4e, III/4e, I/4e, I/3e, I/2e, I/1e and target speeds of 3 and/or 4 degrees/sec, depending on the patient's visual field patterns. In order to compare their location and size, the isopters depicted from SKP and Program K were superimposed. The area of intersection was then expressed as a percentage of the union area. The area and position of the isopters for each defined stimulus condition were compared between the two methods. Test duration was also evaluated.  
Results  
Our results indicated that the shape and size of the isopters from Program K were comparable to those obtained on the same eyes using SKP. The percentage of the intersection area of the total union area for each isopter was 85 % (V/4e), 74 % (III/4e), 65 % (I/4e), 61% (I/3e), 63% (I/2e), and 60% (I/1e). The average percentage of the intersection area was 68%. The average examination duration was 9.0±2.9 minutes for SKP and was 13.3±3.9 minutes for Program K.  
Conclusions  
Program K is a useful fully-automated kinetic perimetric method for assessing visual field loss in clinical practice. Our results found using Program K are very comparable to those found using semi-automated kinetic perimetry. |
Evaluation of Visual Fields With Superior Segmental Optic Hypoplasia (SSOH) Using Fully Automated Kinetic Perimetry (Program K)

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SSOH, Program K, Visual Field

Purpose
To evaluate the usefulness of Program K, a newly developed fully automated kinetic perimetry, for visual field (VF) assessment of SSOH.

Methods
Five patients (average age, 41.6±12.4 yrs) confirmed with SSOH were included in this study. Static perimetry using HFA (programs 24-2 and 30-2), FDT (program N-30-1) and Octopus101 (program G2), and kinetic perimetry using Goldmann perimetry (GP) and Program K were performed on all subjects. VF loss was assessed using the following stimulus characteristics: luminance levels of V/4e, I/4e and I/3e, and target speeds of 3 and/or 5 degrees/sec depending on the patient's visual field pattern. Fundus photography, HRT, OCT, and GDx were also performed for quantitative evaluation of SSOH.

Results
Our results indicated that the shape and size of the isopters depicted by Program K were comparable to those obtained by GP on the same eye. The average examination duration of Program K was 6.5±5.3 minutes.

Conclusions
Program K is easy and useful fully automated kinetic perimetry for assessing visual field loss in clinical practice.
Title: Visual field trend analysis – a population based test

Author: H. Bebie

Co-Authors: E. Bürki, M. Monhart

Commercial relations: C

Support if any:

Keywords: trend analysis, statistical test, ROC curves

Abstract

Purpose
To present a novel test for significant trend in time series of perimetric visual field data.

Methods
Our test is based on simple statistical assumptions concerning fluctuations in time series of normal visual visual fields and makes use of empirical distributions of regression coefficients as found in long-term follow-up data of visual fields classified stable according to clinical criteria.

Results
Our test is considerably more sensitive at the same specificities than the traditional t-test of the regression coefficient. This result is based on empirical ROC characteristics, comparing our test with the traditional t-test.

Conclusions
The novel test is an excellent candidate for the processing of time series of visual field data.

ROC curves for the index MD. Solid line: r-test presented here (one-tailed). Broken line: t-test for the regression coefficient to deviate from zero (one-tailed). Based on 5 consecutive visual field examinations.
<table>
<thead>
<tr>
<th><strong>Title</strong></th>
<th>The logic behind the clear Text analysis in the new Octopus Software</th>
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<tbody>
<tr>
<td><strong>Author</strong></td>
<td>Matthias Monhart</td>
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<tr>
<td><strong>Co-Authors</strong></td>
<td>Ernst Bürki, Hans Bebie</td>
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<td>Visual field classification, Octopus Field Analysis</td>
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<tr>
<th><strong>Abstract</strong></th>
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<tr>
<td></td>
<td>To improve the recognition and classification of Neuro-ophthalmic conditions in visual field tests.</td>
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<td><strong>Methods</strong></td>
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<td>In the research software OFA / Octopus Field Analysis version 2.3 various comparison tests on the base of the hemifields, quadrants and sectors within the same eye and between the left and the right eye are automatically performed.</td>
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<td><strong>Results</strong></td>
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<td>If a certain defect pattern (or normality) is identified with a high probability, the classification is displayed on screen and can be printed with the graphic representation of results.</td>
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<td><strong>Conclusions</strong></td>
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<td>The algorithm already indicates certain neuro-ophthalmic abnormalities that may otherwise easily be missed. A clinical validation is pending and is considered the next step in the development phase.</td>
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</table>
Title | Assessment of the entire (80 degree) visual field with a new fast thresholding algorithm (GATE)
---|---
Author | Ulrich Schiefer
Co-Authors | S. Frick, J. Nevalainen, J. Grobbel, E. Krapp, B. Selig, R. Vonthein, J. Paetzold
| 1 Centre for Ophthalmology / Institute for Ophthalmic Research, University of Tuebingen, Germany; 2 University Eye Hospital Oulu, Finland; 3 Department of Medical Biometry, University of Tuebingen, Germany
Commercial relations | F, I, C
Support if any | Haag Streit Inc., Koeniz, Switzerland
Keywords | Automated static perimetry, fast thresholding strategy, visual field, peripheral visual field, normal values, GATE
Abstract | **Purpose**
To assess age-corrected normative differential luminance sensitivity (DLS) values for automated static perimetry with a new, fast strategy (GATE = German Adaptive Threshold Estimation) for the *entire* (80 degree) visual field – instead of the usually assessed 30 degree eccentricity.

**Methods**
Eighty-one normal subjects, aged from 10 to 79 years were enrolled in this study, which was performed on the new Octopus 900 perimeter (HAAG-STREIT Inc., Koeniz, Switzerland). Eighty-five static stimuli (Goldmann size III = 26°) up to a maximal eccentricity of 80 degrees, with a condensation towards the visual field centre, were presented on a homogeneous background under photopic (luminance level 10 cd/m²) conditions; in an additional test series, the examination procedure was repeated, using static stimuli with Goldmann size V (= 103°). A fast thresholding algorithm (GATE: initial step size of 4 dB and at least one reversal) was used. Local differential luminance sensitivity (DLS) values were estimated by applying the maximum likelihood (ML) procedure. A smooth mathematical model was fitted to the data set, allowing to predict the local DLS values for any location of the entire visual field.

**Results**
Model fit was satisfactory ($R^2 = 0.72 \text{ dB}^2$). The residual standard deviation over the entire 80 degree visual field amounted to 2.52 dB. The number of questions asked (mean) was 338 for the GATE strategy (compared to 410 for the conventional 4-2 dB bracketing algorithm) in this cohort of normal subjects. Typical clinical findings with GATE will be demonstrated and compared with other conventional perimetric methods.

**Conclusions**
A smooth mathematical model allows for the prediction of local differential luminance thresholds of normal subjects for any location within the entire 80 degree visual field, obtained with the new Octopus 900 perimeter, using Goldmann size III or size V stimuli. In normal subjects, the new, fast GATE strategy reduces the number of questions asked by approximately 18%, compared to a conventional 4-2 dB bracketing algorithm. Subsequent examinations with GATE are related to previous exams and therefore further reduce the examination duration in case of manifest scotoma.