TENDENCY ORIENTED PERIMETRY (TOP) ABSTRACTS

TOP W-W

1.- González de la Rosa M (1), Bron A (2), Morales J (3), Sponsel WE (4).
TOP PERIMETRY : A THEORETICAL EVALUATION.

Purpose: Study the capabilities of a new perimetric strategy.

Methods: Tendency Oriented Perimeter attempts to assess the visual field status by asking only one question per location and using every answer also for establishing thresholds in the neighboring area. A computer simulation program was designed to evaluate the TOP strategy. Data was obtained from 75 Humphrey program 30-2 visual fields including patients with diverse degree and nature of pathology.

Results: Excellent agreement was obtained between both gray maps. Correlation coefficient between the mean sensitivity of the Conventional and TOP pairs (r = 0.998, estimated SE = 0.52 dB) and between the percentage of abnormal points of both systems (r = 0.992, estimated SE = 5.17%) was also favorable. Finally, the fluctuation value (SF) obtained by Humphrey strategy (mean = 1.90 ±1.21dB) was slightly above (p< 0.05) the standard deviation calculated for the thresholds obtained with 30-2 program and TOP algorithm (mean = 1.68 ±0.51dB).

Conclusions: The TOP strategy appears to approximate the gray maps and thresholds obtained by conventional perimetry as indicated by this preliminary computer simulation of the program. Further actual testing of patients will produce more information regarding the real life performance of this strategy.

2.- Martinez A, Pareja A, Mantolan C, Sanchez M, Cordoves L, González de la Rosa M.
RESULTS OF THE TENDENCY ORIENTED PERIMETRY (TOP) IN NORMAL POPULATION.

Purpose: Using the TOP algorithm each test point is examined only once. The patient’s response is used to calculate the threshold in the specific test location and in the adjacent area, conditioning the intensity of the following stimuli. The test point that has been already examined is also influenced by the surrounding test area, when examined posteriorly. This study tries to analyse the specificity of the TOP examination.

Methods: 50 eyes of 50 normal subjects were examined with the TOP program in the Octopus 123 Perimeter with a similar distribution to that of program 32, its own normal threshold values and Goldmann III 100 msec. stimulus.

Results: Only 3 patients showed a MD over 2 dB: a 4 D myopic patient (MD=2.54), another with a later prolactinoma suspicion (MD=4.8) and a third (MD=4.29). The remaining 47 had a mean MD of -0.003dB (s.d.=±0.929). 4.8% of the points exceeded 4 dB of deviation in relation to normal thresholds.

Conclusions: TOP perimetry has shown a specificity of 94%, at least, reducing exploration time to 20%. The MD values were quite centred in relation to the normal thresholds of the perimeter.

3.- González de la Rosa M, Martinez A, Sanchez M, Mesa C, Cordovés L, Losada MJ.
ACCURACY OF THE TENDENCY ORIENTED PERIMETRY (TOP) IN THE OCTOPUS 1-2-3 PERIMETER.
University of La Laguna. Spain.

Using the TOP algorithm each test point is examined only once. The patient’s response is used to calculate the threshold in the specific test location and in the adjacent area, conditioning the intensity of the following stimuli. The test point that has been already examined is also influenced by the surrounding test area, when examined afterwards. 52 eyes (29 of males and 23 of females; mean MD 10.06 dB, s.d. ± 7.47) of 42 patients (mean age 54.1 years, s.d. ± 18.9) with different diagnoses and defect levels (12 normals, 22 glaucomatous, 8 neuropathies, 10 chorioretinal lesions) were examined with the TOP and the 32 programs in the Octopus 1-2-3 Perimeter. With the TOP program the MD values were 1.65 dB higher, as an average, than the values obtained with the program 32. Using a linear regression equation the following results were obtained: total MD (r=0.96), MD of each square (r=0.92-0.96), LV (r=0.91) and the individual threshold values (r=0.84). In conclusion the TOP algorithm produces comparable results to those obtained with the conventional bracketing strategy with the advantage that it takes only one fifth or one sixth of the time. With
the TOP program the threshold obtained are slightly higher than with the 32 one, in a similar proportion to the known threshold reduction due to the “fatigue effect” during long examinations.

4.- Martinez Piñero A, Rodriguez J, Serrano M, González de la Rosa M. REPRODUCIBILITY AND ACCURACY OF TENDENCY ORIENTED PERIMETRY (TOP). Invest. Ophthalmol Vis Sci (ARVO Abstract). 1998; 39: S23. Abstract nr 95 University of La Laguna. Spain Purpose: The purpose of this study was to compare the reproducibility and agreement between different global indices obtained with a standard threshold program (32) versus two different TOP strategies. Methods: The sample consisted of 55 patients (55 eyes) with a mean age of 56.1±14.5 years. There were 12 normal subjects, 11 with early glaucoma, 12 with advanced glaucoma, 13 with visual field abnormalities from neurological etiology, and 7 with abnormal fields from chorioretinal lesions. All were examined with program 32 twice and with TOP program twice utilizing the Octopus 1-2-3 perimeter. The first 26 patients were examined with the first TOP version and the last 29 with the new one which incorporates re-examination of points to which the patient did not respond in the initial portion of the exam. Results: Excellent correlation was found between the indices in the four examinations. Differences point by point were slightly better when each strategy was compared with itself than when the comparison was made with the other strategy, but in all cases there was minimal dispersion. TOP produces, on average, 1.5dB higher thresholds. With the newer TOP version threshold fluctuation was less (1.97±2.60 dB) than with the conventional strategy (1.64±2.26 dB) (P<0.01) and the reproducibility of the MD value was higher (r=0.997, MD Fluct: 0.37±0.29dB) than with the standard strategy (r=0.980, MD Fluct: 0.94±0.74 dB) (p<0.01). Conclusions: The TOP algorithm seems to result in better reproducibility and less fluctuation than the standard strategy while the number of questions are reduced 80%

5.- González de la Rosa M, Martinez Piñero A, González Hernández M. REPRODUCIBILITY OF THE TOP ALGORITHM RESULTS VERSUS THE ONES OBTAINED WITH THE BRACKETING PROCEDURE. In Wall M & Wild J (eds), Perimetry Update 1998/1999, Kugler Publ., The Hague, The Netherlands 1999:51-58. University of La Laguna. Spain Purpose: To compare the reproducibility and the accordance between global indices obtained with TOP strategy versus those obtained with a standard bracketing procedure (BP). Methods: 54 patients (54 eyes) with a mean age 55.2 ± 15.4 years: 14 normal subjects, 14 with ocular hypertension and early glaucoma (MD < 7 dB), 11 with advanced glaucoma (MD ≥ 7 dB), 12 with neurological pathology and 3 with chorioretinal lesions. All were examined four times utilising the Octopus 1-2-3 perimeter: twice with the standard 32 program and twice with the TOP program. This TOP version includes re-testing of the points the patient did not respond to at the beginning of the examination. Results: Test duration: 2:57 ± 0:15 min. (TOP) and 13:56 ± 1:40 min. (BP). Excellent correlation was found between the indices of the four examinations. Point by point differences were slightly smaller when each strategy was compared with itself than when the comparison was made with the other strategy, but the dispersion was minimal in all cases. TOP produced, on average, 1.57 dB higher thresholds. With TOP, threshold fluctuation was less (1.54 ± 2.14 dB) than with the BP (1.95 ± 2.42 dB) (P<0.01) and the reproducibility of the MD value was higher (r=0.997, MD Fluct: 0.35 ± 0.31 dB) than with the BP (r = 0.977, MD Fluct: 0.94 ± 0.92 dB) (p<0.01). Conclusions: TOP seems to produce better reproducibility, lower MD fluctuation (63%) and a shorter duration of the test (78.8%) compared with the standard strategy. The differences between TOP and BP are almost of the same size as those between two examinations performed at different times with the traditional bracketing strategy.

University of La Laguna. Spain

**Purpose:** To compare the results of the new TOP perimetric algorithm applied to the G1 point distribution with those from the well known G1-Standard Bracketing strategy.

**Methods:** The G1-TOP program divides the G1 grid of 59 points into four sub-grids and adds 10 extra points. The sub-grids are tested sequentially. Each point is tested only once. Each patient’s response is utilized to modify the tested point and the surrounding ones from the remaining sub-grids. For this task, their relative distances are taken into account. This study included 78 patients (106 eyes), mean age: 54.9 ± 17.2 years. The sample consisted of 47 eyes from patients with early glaucoma (MD < 7 dB), 21 with advanced glaucoma (MD ≥ 7 dB), 12 eyes with visual fields originating from neurological disorders, 11 with abnormal fields from chorioretinal lesions and 15 normal eyes. All subjects were examined consecutively with both programs using the Octopus 1-2-3 perimeter. The order of testing was interchangeable, starting with either G1-TOP or G1-Bracketing program.

**Results:** The results of the G1 version of the TOP algorithm were similar to those obtained in a previous study with the TOP/32 version. Excellent correlation was found between the indices of the two exams and with point by point analysis. G1-TOP produced on average a mean sensitivity which was 0.45 dB thresholds higher than G1-standard. Mean duration of the test for G1-TOP was 2:19 ± 0:36 min., while G1-standard took 11:15 ± 1:17 min. (relation G1-TOP/G1-Standard: 1/4.9, or a net reduction of 79.4%). Normal individuals had the same MD (TOP Vs Bracket. 0.2 ± 1.0 and 0.2 ± 1.5 dB) (p > 0.05) while the LV value was significantly smaller with TOP (TOP Vs Bracket. 4.3 ± 4.1 and 11.0 ± 13.0 dB) (p < 0.05)

**Conclusions:** G1-TOP program produces very similar results to G1-Standard in a small fraction of the time utilised by the traditional Bracketing strategy.

7.- S. Takada, C. Matsumoto, S. Okuyama, A. Iwagaki, T. Otori
COMPARATIVE EVALUATION OF FOUR STRATEGIES (NORMAL, 2LEVEL, DYNAMIC, TOP) USING THE AUTOMATED PERIMETER OCTOPUS1-2-3.
Department of Ophthalmology, Kinki University school of Medicine, Osaka-Sayama, Japan

**Purpose:** Dynamic strategy and tendency oriented perimetry (TOP) are new programs for reducing the test duration of perimetry. We compare these new strategies with normal and 2 level strategies in normal subjects and glaucoma patients.

**Subjects and Methods:** The subjects were 25 eyes of 25 normal (23-61 years old) and 40 eyes of 24 glaucoma patients (28-73 years old). We measured the visual field using four strategies (normal, 2level, dynamic and Top) and compared their test duration, number of questions, sensitivity and specificity. We also studied the correlation of MD and LV between normal strategy, dynamic strategy and TOP.

**Results:** Dynamic strategy showed about 30% decrease in the test duration than normal strategy. TOP showed that the test duration was only about three minutes in all examinations. In early glaucoma patients, sensitivity of dynamic strategy and TOP was equal to that of normal strategy. In patients of stage 1 Aulhorn classification, sensitivities of dynamic strategy and TOP were 94.1%. However, specificity of TOP was low (78.6%). The correlation of MD between normal strategy, dynamic strategy and TOP was excellent. The coefficients of correlation between normal strategy and dynamic were 0.98 (MD), 0.96 (LV), and those of correlation between normal strategy and TOP were 0.97 (MD), 0.92 (LV)

**Conclusion:** Dynamic strategy and TOP are useful programs for the purpose of reducing the test duration of perimetry.

8.- Fritz Dannheim, Steffen Zeyssig
COMPARISON OF TOP AND NORMAL THRESHOLD STRATEGY: EXAMPLES
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A new strategy ("Tendency Oriented Perimetry") had been developed to shorten examination time in computer assisted threshold perimetry [Gonzalez de al Rosa et al. 1997]. We compared this new "TOP" strategy with the conventional bracketing strategy of the OCTOPUS 1-2-3 computer perimeter using program G1X. Thirty-five eyes of 22 subjects have been examined once with either method, starting with the normal threshold. The underlying pathology was glaucoma (n=16), ocular hypertension (n=7), central visual pathway lesions (n=6), AlON (n=2), choked disc (n=1) and others (n=3).
**Results:** Mean examination time was for the normal strategy $11.12 \pm 1.33$ SD, for the TOP strategy $2.25 \pm 0.18$ minutes, independent of the type or degree of perimetric alterations. Twenty-five eyes showed a perfect coincidence of findings for both strategies, 6 a relatively good, and 4 a limited coincidence. Three of the 10 eyes with deviations had more, 7 had the same or less pathology in the TOP finding as opposed to the normal strategy result, and they all occurred only in abnormal fields. The most pronounced differences as present in 4 fields were within a just tolerable range.

A few examples are demonstrated for each type of coincidence, especially in deviating cases. In summary, the new TOP strategy has proven useful in clinical practice as being fast and sufficiently reliable. It is self evident that both patients and technicians are very pleased with the TOP perimetry.

9.- Morales J (1), Weitzman M (2), Gonzalez de la Rosa, M (3)
COMPARISON BETWEEN TENDENCY-ORIENTED PERIMETRY (TOP) AND OCTOPUS THRESHOLD PERIMETRY.
(1) Texas Tech University Health Sciences Center. (2) Yale University School of Medicine. (3) University of La Laguna, Spain

**Purpose:** Tendency Oriented Perimetry (TOP) takes 20% of the time typically required by traditional algorithms. We were interested in comparing the information generated by this program with data obtained by traditional testing.

**Methods:** The sample consisted of 57 subjects, 15 normal and 42 with a variety of visual field abnormalities. Two examinations of standard thresholding testing (program 32) and two examinations of the TOP program were obtained. Comparison of results focused on correlation and reproducibility.

**Results:** Correlation coefficient of global indexes between both tests was high, with mean deviation of $r=0.97$ [SE(YX) $\pm 1.65$dB] and square root of loss variance of $r=0.93$ [SE(YX) $\pm 1.10$dB]. Mean sensitivity tended to be 1dB higher while MD tended to be 1dB lower with TOP strategy. Reproducibility was equally good between both tests for threshold determination as well as for all global indexes (MS, MD per quadrant, and LV). TOP required 80% less presentation of stimuli than the standard. Cluster criteria for abnormality demonstrated TOP versus 32: Sensitivity of 89/87; Specificity of 90/77; Positive predictive value of 96/91; Negative predictive value of 75/68; and Accuracy of 89/84.

**Conclusion:** TOP was 5 times faster than the full-threshold techniques and was successful in detecting visual field abnormalities. TOP performed better at discriminating normals from abnormals. Depth and extent of defects tended to be smaller with TOP. TOP could prove an alternative to traditional perimetric techniques.

10.- Gonzalez de la Rosa M, Morales J, Weijland A.
A COMPARISON OF THE TENDENCY ORIENTED PERIMETRY (TOP) METHOD WITH NORMAL THRESHOLD PERIMETRY
Intezzag Report # 4.0200.0060, 1998
For the underlying report, in a multi-center study, 122 persons (eyes) with varying degree of visual field loss were tested in a total of 387 examinations to compare the results obtained from the TOP Method with the conventional „Normal“ 4-2-1 dB Strategy. Both algorithms were applied to the OCTOPUS program 32. The sample consisted of 36 normal eyes, 6 eyes with suspected glaucoma and 80 eyes with diagnosed different other pathologies.

In a first approach, the objectives of the study were to establish the correlation between the visual field indices Mean Defect [MD] and the Loss Variance [LV] obtained from both methods. Further studies will investigate the point-to-point relation between the TOP and Normal strategies. The data showed an excellent correlation between the visual field indices obtained from both methods. For the Mean Defect the correlation coefficient amounts to 0.73 for the normal visual fields and is above 0.93 for all other categories.

From the point of view of time comparison, significant time savings of approximately 80% can be obtained with the use of TOP. With this method an examination takes about 2½ to 3 minutes instead of the normal 12 to 20 minutes.

11.- Lachkar Y, Barrault O, Lefrancois A, Demailly P.
RAPID TENDENCY ORIENTED PERIMETER (TOP) WITH THE OCTOPUS VISUAL FIELD ANALYZER.
J Fr Ophtalmol 1998 Mar;21(3):180-4

**Purpose:** To study the capabilities of a new perimetric strategy with the Octopus visual field analyzer: the Tendency Oriented Perimetry.

**Methods:** Tendency oriented perimetry (TOP) attempts to assess the visual field by using answers to questions to establish thresholds in the neighboring area. We evaluated 79 visual fields with the Octopus strategy using the program 32 and the TOP strategy split into the following groups: normal visual field or glaucoma suspects (52), moderately advanced glaucoma (16), advanced glaucoma (11). The following parameters were analyzed for the two strategies studied: examination time, MS (mean sensitivity), MD (mean defect), LV (Loss Variance), short term fluctuation (RF) and the number of points with a deficit with different p values: p < 0.5; p < 1; p < 2; p < 5.

**Results:** TOP perimetry showed a significant reduction of exploration time: 11.87 minutes with the Octopus 32 vs 2.49 minutes with the TOP strategy (p < 0.001). There is no significant modification for the other parameters (MD, MS, RF) except for the LV (Loss Variance) for the global analysis and for each separate group.

**Conclusion:** The TOP strategy reduces examination time significantly but seems to be less accurate especially for the calculation of the depth of each scotoma in comparison with the standard Octopus 32 perimetry.

12.- González Hernandez M, Martinez Piñero A, Fariña FJ, González de la Rosa M

**RELATION BETWEEN THE MEAN DEFECT AND THE LOSS VARIANCE IN TOP AND BRACKETING PERIMETRIC STRATEGIES.**


University of La Laguna. Spain.

**Purpose:** To verify the relationship between the deepness of the mean defect (MD) and the irregularity of the visual field (LV) in glaucoma, utilizing the conventional Bracketing perimetric strategy and the Tendency Oriented Perimetry (TOP) in patients with MD lower than 18 dB.

**Methods:** The sample consisted of 91 glaucoma or glaucoma suspected patients (91eyes) with a mean age of 60.7 ± 20.8 years. 26 were examined with program 32 (two phases) and 65 with program G1 (one phase) with both strategies utilizing the Octopus 1-2-3 perimeter.

**Results:** 83 cases had MD values lower than 18 dB with Bracketing and 84 with TOP. They were coincident in 82 cases. The correlation between the MD and the LV was higher with TOP (r^2 = 0.67) than with Bracketing (r^2 = 0.50) (p=0.06). In both strategies, the correlation values between the MD and LV were lower than those described by Pearson utilizing the CLV (r^2 = 0.85)(*). For the group of patients examined in two phases (22 cases) the fluctuation was lower with TOP (2.1 ± 1.05 dB) than with Bracketing (3.0 ± 0.94 dB)(p<0.01).

**Conclusions:** There is a relationship between the irregularity of the field (LV) and the MD. That relation is indicative of the tendency that the glaucomatous patient has to suffer defects in specific localized areas of the visual field, being the apparition of diffuse defects less frequent. TOP strategy produces a smoothening of the edges of sharp scotomas, producing a reduction on the LV value and hence, more diffuse defects are expected. However, our results suggest that TOP correctly interprets the topographical irregularity of the field during different phases of the disease. The higher correlation obtained with TOP may be related to its lower tendency to produce extreme results and false irregularities because of its lower fluctuation.


13.- Horikoshi NC, Osako M, Goto H, Tamura Y, Okano T.

**REPRODUCIBILITY OF TENDENCY ORIENTED PERIMETRY (TOP) FOR THE OCTOPUS PERIMETER.**


Tokyo Medical University.

**Purpose:** Tendency Oriented Perimetry (TOP) is a fast thresholding algorithm for the Octopus perimeter. In this algorithm, short-term fluctuation (SF) can not be evaluated because each test point is examined only once at the same test. In this study, we investigated the reproducibility of the visual field by two successive test using TOP.

**Methods:** Subjects are comprised of 38 eyes of 38 normal persons, 9 eyes of 9 cases with ocular hypertension, and 39 eyes of 39 cases with glaucoma. Program G1X of the OCTOPUS1-2-3 was performed consecutively twice on all subjects using TOP. The results of the TOP was also compared with those of normal strategy (NS).
Results: The mean of mean defect (MD) at the first and second test was 3.5±4.7dB, 3.7±4.9dB, respectively. The mean of loss variance (LV) at the first and second test was 16.2±24.9dB², 16.1±23.8 dB², respectively. The regression line between first and second test was shown as y=1.02 x+0.1 (r=0.97, p<0.0001) in the MD and y=0.92 x+2.2 (r=0.65, p<0.0001) in the TOP and y=0.08 x+1.6 (r=0.51, p<0.0001) in the NS. The SF for TOP (3.0±0.9 dB) was significantly larger than that for NS (2.3±0.6 dB) in glaucoma patients (p<0.0001).

Conclusions: Although good reproducibility was found in the MD and LV using TOP, the SF for TOP became larger with an increase of MD compared with that for NS. It is thought that an increase of SF in the TOP was caused by the fluctuations of threshold in depressed lesion of the visual field.

14.- Dubay HB(1), Cyrlin MN (2), Rosenshein JS (1), Tressler CS (3).

COMPARISON OF TENDENCY ORIENTED PERIMETRY (TOP) FAST STRATEGY FOR PROGRAM 32 AND THE GLAUCOMA PROGRAMS (G1, G2) ON THE OCTOPUS PERIMETER VS. THE HUMPHREY VISUAL FIELD ANALYZER PROGRAM 24-2 IN GLAUCOMA SUSPECTS AND GLAUCOMA PATIENTS.

(1) Franklin Eye Consultants, Southfield, MI, (2) Oakland University, Rochester, MI, (3) Uniformed Services University of Health Sciences, Bethesda, MD

Purpose: To compare the Tendency Oriented Perimetry (TOP) fast strategy for program 32 and the glaucoma programs (G1, G2) on the Octopus (OCTO) 101 and 123 perimeters with the Humphrey Visual Field Analyzer (HVFA) program 24-2 in glaucoma suspects and glaucoma patients.

Methods: Forty-five eyes in 23 glaucoma suspects or patients who were found to have reliable HVFA 24-2 tests (0-3 FL, 0-2 FP, 0-3 FN) were randomized to testing with the TOP 32 or TOP G programs. Following the first OCTO program, the alternative program was performed. Values of mean sensitivity (MS) and mean defect (MD) scores on the OCTO perimeters were converted to equivalent HVFA decibel values for comparison purposes using published conversion formulas. Comparisons of MS, MD and testing time were made. Assessment of patient satisfaction and clinical, qualitative evaluation of the visual fields were performed.

Results: Mean test times for the HFVA 24-2 were OD 10.89, OS 11.04 minutes. Mean test times for OCTO TOP 32 were OD 2.25, OS 2.30 minutes and for OCTO G1, G2 were OD 2.34, OS 2.32 minutes. MD scores for OCTO TOP 32 were OD 11.4, OS 12.0 dB and for G1, G2 were OD 11.3, OS 10.1 dB. MS scores for OCTO TOP 32 were OD 24.5, OS 24.6 dB, and for G1, G2 OD 23.8, OS 26.0 dB. There were no significant differences in the test time, MD or MS for TOP 32 vs. the TOP G1, G2 programs. Patients unanimously preferred the TOP programs to the HVFA 24-2 due to decreased test time, less fatigue and perceived greater accuracy. There was no significant preference for program 32 vs. G1 or G2. The HVFA and OCTO fields were comparable on qualitative clinical assessment.

Conclusions: The OCTO TOP programs provide similar clinical information to the HVFA 24-2 in less time and with greater patient satisfaction.

15.- Horikoshi N, Osako M, Goto H, Tamura Y, Okano T.

CLINICAL EVALUATION OF TENDENCY ORIENTED PERIMETRY IN OCTOPUS PERIMETER.

Tokyo Medical University.

We evaluated the clinical value of Tendency Oriented Perimetry (TOP) built in the Octopus 1-2-3 perimeter. A total of 113 eyes were tested, comprising 40 eyes of 40 normal persons, 9 eyes of 9 cases with ocular hypertension and 64 eyes of 40 cases with glaucoma. All the eyes were also tested by program G1X of the perimeter using Normal Strategy (NS): The testing time with TOP averaged 13.1% of that with NS. There was no difference in mean defect between TOP and NS. The loss variance was significantly lower for TOP than NS (p<0.0001). The findings show that perimetry with TOP results in shorter testing time and that TOP is more efficient than NS. TOP has the disadvantage in describing the shape of the visual field.

16.- Gore A, McCleary D, Comer G. A COMPARISON OF THE OCTOPUS TOP STRATEGY AND NORMAL STRATEGY.

Southern California College of Optometry, Fullerton, CA

Purpose: Fatigue due to excessive testing time has been showed to have a significant impact on the quality and accuracy of visual fields obtained using traditional threshold testing algorithms such as the Octopus Normal strategy. The Octopus TOP strategy is designed to greatly reduce testing time. This
study was undertaken to determine the difference between visual defects on the Octopus G1X Normal and TOP strategies.

**Methods:** Forty-three pairs of fields were compared; each pair consisted of a visual field printout obtained from the same eye using the G1X Normal and TOP strategies. The data were analyzed in three ways: a statistical analysis comparing mean defect and loss variance between the two strategies, a clinical classification of each field defect as early, moderate and severe and a comparison of the mean sensitivity between the two strategies at all 59 test locations.

**Results:** The difference between the mean defect for the Normal strategy (4.34 ± 4.25) and that for the TOP strategy (4.35 ± 4.25) was found not to be significant (p=0.30). The difference between loss variance for the Normal strategy (40.34 ± 41.76) and that for the TOP strategy (29.29 ± 38.18), however, was found to be significant (p < 0.00005). The mean duration of the TOP program was 2.23± 0.34 minutes versus 11.28±1.51 minutes on the Normal strategy. Clinically grading the 43 sets of fields as having early, moderate or severe loss revealed that ten (23%) differed by one stage; none differed by two stages. A pointwise analysis of the mean thresholds difference between TOP and Normal for each point tested revealed that 22% were significantly different (p<0.05).

**Conclusions:** There was no significant between mean defect and mean sensitivity for the two strategies; there was for loss variance. The TOP program should be used with caution when following a field defect.

**Comments (Prof. M. Gonzalez de la Rosa):**

- We know that TOP gives a lower loss of variance. All our papers, as well as others, have shown the fact that. However, the important thing is to know that the LV in TOP is well correlated with the LV in standard perimetry. The fact that two machines work with different but perfectly correlated scales, does not mean that they are less useful, but that he user must know the particularities of each instrument.
- It is irrelevant that a point-wise study finds 22% significant differences. We have shown that when one repeats the standard strategy twice, the exact same thing happens, due to the threshold fluctuation.

17. - M.A. Gonzalez de la Rosa¹, M. Gonzalez-Hernandez¹, M. Abraldes¹, A. Azuara-Blanco²
QUANTIFICATION OF TOPOGRAPHIC CORRELATIONS OF THRESHOLD VALUES IN GLAUCOMATOUS VISUAL FIELD.
La Laguna Univ. Spain¹; Princess Alexandra Eye Pavilion. Edinburgh Univ.UK².

**Purpose:** To analyze inter-point dependence of threshold values within the visual field and their relationship with the path followed by the retinal ganglion cell axons on their way towards the optic nerve head in glaucoma.

**Methods:** Visual fields from glaucoma patients and glaucoma suspects were analyzed (n=255, one eye per patient) using the 32 program on the Octopus 1-2-3. Determination coefficient ($r^2$) for the thresholds of each of the 74 points were calculated with relation to the 73 other points (2701 combinations) using lineal regression analysis, and categorized as "high"($r^2>0.66$), "moderate"($r^2=0.33-0.65$) and "low" ($r^2<0.33$).

**Results:** The sensitivity of each point reached the highest correlation with points located in its surroundings and with those points that have anatomical relationships due to the course of the retinal nerve fibers. The relationship was minimal with points on the opposite hemi-field and with those not related by the anatomy of the retinal nerve fibers. Specifically, (1) correlations of nasal points close to the horizontal midline were high with neighboring points, high-moderate with those located in the arcuate area of the same hemifield and low with temporal points located between fixation and the blind spot. (2) The sectors of the visual field located above and below the blind spot had high correlations with neighboring points and high-moderate ones with proximal and distal points located in the area defined by the course of the retinal nerve fibers of the same hemifield. (3) Points located temporally to the blind spot had high-moderate correlations with temporal points corresponding to the same nerve fiber bundle, including locations of the opposite hemifield. (4) The two central points temporal to fixation have low correlations with peripheral ones and good correlations with other central points of the same hemi-field and with those that anatomically correspond to the maculo-papillar bundle.

**Conclusions:** Locations of the visual field have highest inter-point correlation with neighboring points and with those in areas corresponding to the distribution of the retinal nerve fiber layer, even at distance.

HUMPHREY SITA VS OCTOPUS TOP IN GLAUCOMA PATIENTS.
Schnurmacher Institute for Vision Research, SUNY State College of Optometry, 100 East 24th St., New York, NY 10010.

Purpose: Both Humphrey SITA (Swedish Interactive Threshold Algorithm) and Octopus TOP (Tendency Oriented Perimetry) allow for fast threshold perimetry. However, TOP completes testing in a shorter test time. The purpose of this study was to compare field defects as determined by SITA Fast (SF) and TOP vs. SITA Standard (SS) to determine correlation in known glaucoma patients.

Methods: Twenty patients (32 eyes) with various forms and stages of glaucoma having reliable prior visual field testing experience were identified. SS 30-2 and SF 30-2 were run on the Humphrey Field Analyzer (HFA II). The TOP 32 program was run on the Octopus 1-2-3 perimeter. All three testing strategies test a similar grid of points in which 19 points are tested in each of four quadrants six degrees apart in a grid-like fashion. Testing order was randomized and one minute demonstrations were used when necessary.

Correlation between the three field results was determined by a mathematical formula based upon the number and location of statistically significant defect points (p<1.0% and p<0.5%). Average test duration and mean deviation were also determined for all three programs.

Results: There was a moderate positive correlation between SS and SF (r=0.57) and between SS and TOP (r=0.46), which was statistically significant. Correlations of all three tests improved in moderate to advanced glaucoma patients having a greater number of significant field defects. The average test durations were as follows: SS=8.7 minutes, SF=5.7 minutes and TOP=2.5 minutes per eye. This difference was statistically significant (p<0.001). There was no statistically significant difference in the average mean deviation between the three testing strategies.

Conclusions: In this study, both SF and TOP demonstrated moderate and almost equal correlation to SS, however TOP was on average 2.3 times faster than SF.

19.- A. Azuara-Blanco, A.J.W. King, A. Taguri.
COMPARISON OF TWO FAST STRATEGIES FOR VISUAL FIELD ASSESSMENT IN GLAUCOMA: HUMPHREY’S SITA-FAST AND OCTOPUS’ TOP
Princess Alexandra Eye Pavilion, Edinburgh, Scotland.

Purpose: To compare two strategies of visual field analysis, Humphrey's SITA-fast 24-2 (SF) and Octopus’ TOP-30 (TOP) in glaucoma patients, and to determine the test time and patient preference for each strategy.

Methods: Forty-eight patients with ocular hypertension or glaucoma were included. All patients had previous experience with computerized perimetry. One eye per patient was randomly selected for this study. Based on previous threshold perimetry, 19 cases had "normal visual field" or "mild visual field loss", 18 cases had "moderate visual field loss" and 11 had "severe visual field loss". The visual field tests SF and TOP were performed in random order. Patients' test preference was evaluated by asking the question: "which test did you prefer?" Correlation coefficient was used to compare global indices. Additionally, qualitative comparison (inter-test agreement) between SF and TOP was done: two masked glaucoma experts judged each visual field to be "normal" or "glaucomatous". If both observers agreed, the test was considered either "normal" or "glaucomatosus". If experts disagreed, the test was not included for qualitative comparison.

Results: Duration of the test was 4.1 ±0.82 and 2.45 ±0.44 minutes for the SF and TOP strategy, respectively (p<0.001). Twenty-three patients expressed a preference for the TOP test, 11 for the SF test, and 14 for neither. The preference was influenced by the order of visual field testing, with patients performing the SF test prior to the TOP being more likely to prefer the TOP test (p<0.03). The correlation between visual field indices was: MD (SF and TOP), r=-0.8; PSD (SF) and LV (TOP), r=0.77. Agreement between observers in judging the test as "normal" or "glaucomatous" was 98.9%. Qualitative agreement between SF and TOP was 97.9%.

Conclusions: Octopus’ TOP strategy was faster than Humphrey’s SF in glaucoma patients, and was preferred by most glaucoma patients. Both strategies, as compared in this study, appear to produce similar results.

20.- Maeda H, Nakamura M.
A NEW RAPID PERIMETRY TEST WITH DYNAMIC STRATEGY AND A TENDENCY ORIENTED PROGRAM (TOP) TO DETECT GLAUCOMA.
Kobe University School of Medicine; Japan.

To investigate the efficiency and reliability of a new perimetry test algorithm, the results of two computerized static threshold perimetry strategies, namely a Dynamic strategy (DS) and a Tendency Oriented Program (TOP), were compared with the results of testing using the standard full threshold strategy (4-2 dB), DS and TOP of a modified Octopus 1-2-3 perimeter and program 32 X as the test grid pattern. They compared the efficiency (time required for presentation of the stimulus and obtaining the results), and the global indices, mean sensitivity (MS) and loss variance (LV) of the strategies. Compared to the normal full thresholds strategy, the mean test time with DS was 47.7% less, and with TOP it was 82% less. With regard to global indices, the authors noted a tendency toward depression of mean retinal sensitivity using DS compared to the normal strategy. The results show DS to be considerably more efficient that TOP for detection of early glaucomatous defects, whereas TOP was found to be the most time-efficient.

21.- Fabre K, Michiels I, Zeyen T.
THE SENSITIVITY AND SPECIFICITY OF TOP, FDP AND GDX IN SCREENING FOR EARLY GLAUCOMA.
Department of Ophthalmology, A.Z. Middelheim, Antwerp.
The purpose of this study was to evaluate the efficacy of three screening tests in detecting glaucoma in its early stage: the Tendency Oriented Perimetry (TOP) and Frequency Doubling Perimetry (FDP) visual field tests, and the Glaucoma Diagnostic (Gdx) nerve fibre layer analyser. Eighteen patients with glaucoma who showed an early defect on HFA c 24-2 and twenty normals underwent the three tests. TOP showed a sensitivity of 94.4% and a specificity of 75%, FDP showed a sensitivity of 72.2% and a specificity of 100%, and Gdx a sensitivity of 77.7% and a specificity of 60%.

22.- González de la Rosa M, Mesa F, Arteaga V, González-Hernández M.
SECOND GENERATION OF THE TENDENCY ORIENTED PERIMETRY ALGORITHM: TOP+.
Purpose: The TOP strategy divides the points of the visual field in four intercalated matrices. Each point is examined once and each answer is applied to the surrounding points. In the case of scotomas with sharp edges, smoothening and hence reduction of the loss variance (LV) is produced. The algorithm has been modified in order to eliminate this effect.
Methods: In a previous paper (*) we proved that the threshold at a certain point has a high relationship with those nerve fibers that follow a similar path towards the optic disc, even when located far from each other. Patient’s answers to each matrix allow threshold estimation, considering the answers to both proximal and distant related points. These values are used to examine the next matrix. The equations have been calculated using step by step multiple regression and 1116 Octopus bracketing 32 visual fields (309 normal, 581 glaucoma, 309 neurological patients and 28 subjects with chorioretinal lesions).
Results: Theoretically, the new algorithm provides results very close to real thresholds. The correlation coefficient (and error of estimation of Y over X) for the MD and the sLV were 1.00 (0.45 dB) and 0.98 (0.44 dB) respectively. The average of the differences between the 82584 pairs of examined thresholds (actual and estimated) was 1.4 dB. The number of absolute scotomas coincided at 99% and the mean sLV at 96%. Conservation of border contrast was seen in sharp scotomas, such as the nasal steps in glaucoma and hemianopsias.
Conclusions: TOP+ corrects TOP’s tendency to smooth the edges of sharp scotomas and improves LV estimation.

23.- Gonzalez de la Rosa M, Gonzalez-Hernandez M.
SCREENING FOR GLAUCOMA EVALUATING VISUAL FUNCTION.
The qualities required from a glaucoma screening method are described: sensitivity, specificity, speed, simplicity, accuracy, technical rigour, objectivity, reproducibility and easiness of interpretation. Some tests such as colour vision or blue/yellow perimetry have normality patterns that are excessively sparse, some other tests such as OKP lack objectivity and technical rigour. Automatic static perimetry, using rapid perimetric strategies, is the most efficient method nowadays. New perimetric methods, such as FDP, flicker perimetry, color and motion perimetry are commented on. These are all techniques that try to
increase sensitivity in order to achieve early diagnosis.

24.- Morales J, Brown SM
RESULTS OF CLINICAL STUDY WITH TOP PERIMETRY IN CHILDREN 6-12 YEARS OLD.
Texas Tech University Department of Ophthalmology.
Automated perimetry testing would be advantageous if feasible in school-aged children. Known problems regarding its use in this age group are difficulty comprehending the test, rapid boredom, fatigue and distraction. With the advent of ultra-short automated perimetry such as T.O.P. some of these problems could be overcome. The purpose of the study was to evaluate the feasibility of testing normal children with this type of perimetric algorithm. Fifty normal children aged 6-12 underwent TOP-32 testing, twice in each eye with an Octopus 1-2-3. All subjects were able to complete the 4 tests. Average testing time was 230 ±0.2 minutes. Average session time was 25.8±4.87 minutes. 80% of the children were able to finish in less than half an hour including training, testing protocol, and resting periods. Improvement in the specificity of the test occurred in direct relation to subject age. Overall specificity was 81% and it reached 89% in children older than 7 years. Mean sensitivity increased, and test duration decreased as a function of age. Specificity results need to be interpreted with the consideration that some of the parameters to define "normal" are based on adult population. In children 6-7 years old, significant inter-individual variability was present and testing success was more dependent on the child’s maturity and ability to concentrate. Ultra-short visual field programs that can be completed in less than 3 minutes, such as TOP, now offer the possibility of testing children successfully. Most children will perform well, although in the 8 year old and younger age group factors of individual maturity, concentration, and effort cause greater variability.

CLINICAL EXPERIENCE WITH TOP AND NEUROLOGICAL DEFECTS.
Texas Tech University Department of Ophthalmology.
Standard threshold automated perimetry is effectively utilized to detect and manage neuro-ophtalmological diseases. However, the lengthy standard procedure (14-16 minutes) makes it desirable to attempt the use of shorter perimetry methods. Over the last two years we have been paying particular attention to the performance of the ultra-short automated perimetry test T.O.P. (Tendency Oriented Perimetry) in these kinds of patients. Initial observations showing that the edges of the scotomas are softened by the "lateral influence" part of the algorithm have been confirmed. It has also been observed that this particularity of TOP occurs in any sharp edged scotoma whether it is respecting the vertical mid-line, horizontal mid-line, or an isolated scotoma. This softening of the edges does not seem to interfere with the capability of the clinician to recognize the main neurological patterns of abnormality. There seems to be a definite advantage in utilizing TOP perimetry over suprathreshold perimeter since there is a more significant saving of time as well as more information obtained regarding threshold level. Examples will be presented where TOP was useful to detect visual field abnormalities originating in neuro-ophtalmological disease in a fraction of the time required by standard threshold perimetry.

26.- Dannheim F
REPRODUCIBILITY OF GLAUCOMATOUS VISUAL FIELD WITH THE OCTOPUS 1-2-3 PERIMETER APPLYING THE NORMAL BRACKETING AND THE FAST STRATEGY TOP.
Dept. of Ophthalmology, General Hospital, Hamburg.
Without summary. To see the complete text.

27.- De Natale R, Dorigo MT.
TENDENCY ORIENTED PERIMETRY AND STAIRCASE FULL THRESHOLD PERIMETRY IN PRIMARY OPEN ANGLE. COMPARISON OF TWO STRATEGIES.
University Eye Clinic of Verona, Italy, University Eye Clinic of Padua, Italy.
Without summary. To see the complete text.
28.- Aquino M
A COMPARISON OF THE TENDENCY ORIENTED PERIMETRY (TOP) METHOD WITH NORMAL THRESHOLD PERIMETRY.
UP-Philippine General Hospital, St. Luke's Medical Center
Glaucoma patients with varying severity of visual field damage were subjected to visual field examinations using tendency oriented perimetry and the normal threshold 4-2-1 dB strategy. The OCTOPUS program 32 was used in the application of the two algorithms. The results of the examinations were compared. The objective of the study is to correlate the global visual indices Mean Defect and Loss Variance as well as the Mean Defect in each quadrant obtained in the use of the two strategies. Using regression analysis of the data there was a very good correlation with p-value of <0.05 between the visual field indices from the TOP method and those from the Normal threshold method. The examination time was reduced by about 80% with the use of Tendency Oriented Perimetry each examination lasting less than 3 minutes where as normal threshold perimetry usually takes up to 20 minutes.

29.- Kratochvilova P.
TOP VERSUS NORMAL THRESHOLDS STRATEGY, OUR EXPERIENCES IN CLINICAL PRACTICE.
Department of Ophthalmology, Hospital of Privram, Czech Republic.
Without summary. To see the complete text.

30.- González de la Rosa M, García-Feijoo J, Rodríguez J, González-Hernández M.
TWO YEARS EXPERIENCE WITH TOP.
Hospital Universitario de Canarias. Spain.
This is an overlook to all papers in relation to the TOP strategy that have come out after the last Octopus Users Meeting: Lachkar (1998), Horikoshi (1999) and Gore (1999) verified that TOP produces results comparable to bracketing conventional perimetry, using a fifth of the testing time. In the three papers, the LV is well correlated in both strategies but gives lower values in TOP. Gonzalez-Hernandez (1999) however, found that the SF and MD are better correlated in TOP than in Bracketing. Horikoshi (1999) found as well that the SF and MD are better correlated in TOP than in Bracketing, but that TOP (intratest) has a higher SF than Bracketing (intratest). Gonzalez-Hernandez (1999) however, found less SF in TOP (intratest) than in Bracketing (intertest).TOP is faster than the Dynamic program (Maeda, 1999), than the Humphrey 24-2 program (Bubay, 1999) and than the SITA-S and SITA-F programs (Bass, 2000 and Azaura-Blanco, 2000), giving equivalent results and been preferred by most patients.
García-Feijoo (2000) confirmed the precocity of defects in TOP-Flicker in a third of ocular hypertensive patients with normal WW perimetry and Gallardo-Sanchez (2000) in 70% of normal eyes from patients with asymmetric glaucoma. Our group (Rodriguez, 2000) proved that the defects of ocular hypertensive patients are reproducible in repeated examinations and that, just like in conventional perimetry, the fluctuation for TOP-Flicker is higher for higher MDs. We advise that TOP-Flicker is a technique that is only useful on patients with a good level of collaboration and ability of attention, and that it tends to give false pathologials. Bad collaboration reduces its sensitivity, but not its specificity.

31.- González de la Rosa A, Mesa F, Aguilar J, González-Hernández M.
INTRODUCING TOP +
Hospital Universitario de Canarias. Spain.
Purpose: The TOP strategy divides the points of the visual field in four intercalated matrices. Each point is examined once and each answer is applied to the surrounding points. In the case of scotomas with sharp edges, smoothening and hence reduction of the loss variance (LV) is produced. The algorithm has been modified in order to eliminate this effect.
Methods: In a previous paper (*) we proved that the threshold at a certain point has a high relationship with those nerve fibers that follow a similar path towards the optic disc, even when located far from each other. Patient’s answers to each matrix allow threshold estimation, considering the answers to both proximal and distant related points. These values are used to examine the next matrix. The equations have been calculated using step by step multiple regression and 1116 Octopus bracketing 32 visual fields (309 normal, 581 glaucoma, 309 neurological patients and 28 subjects with chorioretinal lesions).
Results: Theoretically, the new algorithm provides results very close to real thresholds. The correlation coefficient (and error of estimation of Y over X) for the MD and the sLV were 1.00 (0.45 dB) and 0.98 (0.44 dB) respectively. The average of the differences between the 82584 pairs of examined thresholds (actual and estimated) was 1.4 dB. The number of absolute scotomas coincided at 99% and the mean sLV at 96%. Conservation of border contrast was seen in sharp scotomas, such as the nasal steps in glaucoma and hemianopsias.

Conclusions: TOP+ corrects TOP’s tendency to smooth the edges of sharp scotomas and improves LV estimation.


32.- Maeda H, Nakaura M, Negi A
NEW PERIMETRIC THRESHOLD TEST ALGORITHM WITH DYNAMIC STRATEGY AND TENDENCY ORIENTED PERIMETRY (TOP) IN GLAUCOMATOUS EYES.
Eye. 5:747-751, 2000

Department of Ophthalmology, Kobe University School of Medicine, 7-5-2 Kusunoki-cho, Chuo-ku, Kobe-shi, Hyogo 650, Japan. hidetaka@med.kobe-u.ac.jp

Purpose: To investigate the time-wise reliability and efficiency of two new perimetric test algorithms, two computerised static threshold perimetry strategies, namely dynamic strategy (DS) and tendency oriented perimetry (TOP), were compared with the standard full-threshold strategy (normal strategy, NS).

Methods: We examined 41 eyes of 41 normal individuals without any ocular disease and 36 eyes of 36 glaucomatous patients, with the NS (4-to-2 dB), DS and TOP using an Octopus 1-2-3 perimeter. We analysed test time, stimulus time and the two global indices, mean sensitivity (MS) and loss variance (LV). Program 32X was used as test grid pattern.

Results: The mean test time for the NS was reduced by 52% with the DS and by 78% with the TOP strategy. Concerning the global indices, the MS value did not differ among the three strategies in the control or glaucoma group. However, the LV value was lower in the TOP strategy compared with the other two strategies in the glaucoma group. This suggested that the TOP strategy underestimated local glaucomatous visual field defects. The ability to detect early-stage glaucoma with the DS and TOP was inferior to that with the NS.

Conclusions: The DS was more efficient than the TOP strategy for the detection of early glaucomatous defects, whereas the TOP strategy required less testing time. The TOP strategy may be an appropriate approach for patients in whom time-consuming perimetry is not possible, or in whom the visual field defect is already advanced.

33.- Morales J, Brown SM.
THE FEASIBILITY OF SHORT AUTOMATED STATIC PERIMETRY IN CHILDREN.

Department of Ophthalmology and Visual Sciences, Texas Tech University Health Sciences Center, Lubbock, Texas

Objective: To evaluate the feasibility of short automated static perimetry using tendency-oriented perimetry in the pediatric population.

Design: Prospective observational case series.

Participants: Fifty normal children age 6 through 12 years.

Testing: Subjects underwent testing with the Octopus TOP-32 program on the Octopus 1-2-3 automated perimeter. Testing was performed in a typical clinical setting without adaptations to the perimeter, prolonged training, or the use of custom seating. Each eye was tested twice.

Main outcome measures: Ability to complete automated static perimetry tests with both eyes. Mean sensitivity, mean defect, and loss of variance; gray scale and numeric representations of the field; duration of each test and of the entire session; subjective assessment of each test as normal or abnormal; calculation of test specificity. Comparisons by age and test number were performed.

Results: All subjects successfully completed all four tests. The mean duration for each test was 2:30 ± 0.23 minutes. The average time for the whole session, including training, testing both eyes twice, and rest periods, was 25.8 ± 4.87 minutes. Improvement in the specificity of the test (fewer abnormal tests in normal children) occurred in direct relation to subject age (R = 0.5).

Conclusions: Automated static perimetry using short, tendency-oriented programs can be successfully performed in normal children age 6 through 12 years in a typical clinical setting. Age was the best predictor of the mean sensitivity, reproducibility, and accuracy of the test, with the most reliable results obtained after 7 years of age. In children 6 to 7 years old, significant interindividual variability was present,
and testing success was more dependent on the child’s maturity and ability to concentrate. Short automated perimetry seems to be a promising tool for the evaluation of peripheral vision in pediatric patients.


Hospital Clinic I Provincial, Barcelona, Spain. 28545crl@comb.es
Purpose: We evaluated the efficacy of topical brimonidine in visual field preservation and/or improvement in eyes undergoing controlled glaucoma.
Methods: Seventy eyes of patients were trained with two different visual field test strategies: The Octopus Tendency Oriented Perimetry (TOP) G1 and the Frequency Doubling Technology (FDT) 30 degrees. Following 2-4 months of brimonidine treatment, there were significant improvements in visual field, as assessed using the TOP G1 strategy (p = 0.003). The FDT 30 degrees test revealed no statistically significant differences.

Conclusions: These data support the results of other studies, which indicate that brimonidine may increase mean sensitivity in visual field tests. Since it is known that the control of intraocular pressure does not fully protect glaucomatous eyes from visual field loss, it is possible that the neuroprotective qualities of brimonidine may contribute to visual field preservation in glaucomatous eyes.


Purpose: The authors sought to quantify neighboring and distant interpoint correlations of threshold values within the visual field in patients with glaucoma.

Methods: Visual fields of patients with confirmed or suspect glaucoma were analyzed (n=255). One eye per patient was included. Patients were examined using the 32 program on the Octopus 1-2-3. Linear regression analysis among each of the locations and the rest of the points of the visual field was performed, and the correlation coefficient was calculated. The degree of correlation was categorized as “high” ($r^2 > 0.66$), “moderate” ($0.66 > r^2 > 0.33$) and “low” ($r^2 < 0.33$). The standard error of threshold estimation was calculated.

Results: Most locations of the visual field had high and moderate correlations with neighboring points and with distant locations corresponding to the same nerve fiber bundle. Locations of the visual field had low correlations with those of the opposite hemifield with the exception of locations temporal to the blind spot. The standard error of threshold estimation increased from 0.6 to 0.9 dB with an $r^2$ reduction of 0.1.

Conclusion: Locations of the visual field have highest interpoint correlation with neighboring points and with distant points in areas corresponding to the distribution of the retinal nerve fiber layer. The quantification of inter-point correlations may be useful in the design and interpretation of visual field tests in patient with glaucoma.


Purpose: To propose a classification of glaucomatous visual fields based on affected ganglion cell axons on their way through the optic nerve head.

Material and Method. 255 filed Octopus 1-2-3 visual fields from glaucoma patients and glaucoma suspects were analysed.

Results. Significant correlation was found ($r^2>0.33$) with very distant points sensitivity related to the ones close to the optic disc, due to the fibre path. Seven areas could be defined by this method: three of them are not affected or latterly affected by the disease: S1 and I1 corresponding to the upper and lower papillomacular bundle and T, located on the temporal aspect to the blind spot. Areas S2 and I2 correspond to the nasal and para-central upper and lower sensitivities. Areas S3 and I3 are in the border of upper and lower nasal fields where axons enter the optic disc at the apical portions.
37.- Wadood AC, Azuara-Blanco A, Aspinall P, Taguri A, King AJ.
SENSITIVITY AND SPECIFICITY OF FREQUENCY-DOUBLING TECHNOLOGY, TENDENCY-
ORIENTED PERIMETRY, AND HUMPHREY SWEDISH INTERACTIVE THRESHOLD ALGORITHM-
FAST PERIMETRY IN A GLAUCOMA PRACTICE.
Department of Ophthalmology, Lothian University Hospitals, Edinburgh, United Kingdom.

Purpose: To evaluate the sensitivity and specificity of the screening mode of the Humphrey-Welch Allyn frequency-doubling technology (FDT), Octopus tendency-oriented perimetry (TOP), and the Humphrey Swedish Interactive Threshold Algorithm (SITA)-fast (HSF) in patients with glaucoma. DESIGN: A comparative consecutive case series.

Methods: This was a prospective study which took place in the glaucoma unit of an academic department of ophthalmology. One eye of 70 consecutive glaucoma patients and 28 age-matched normal subjects was studied. Eyes were examined with the program C-20 of FDT, G1-TOP, and 24-2 HSF in one visit and in random order. The gold standard for glaucoma was presence of a typical glaucomatous optic disk appearance on stereoscopic examination, which was judged by a glaucoma expert. The sensitivity and specificity, positive and negative predictive value, and receiver operating characteristic (ROC) curves of two algorithms for the FDT screening test, two algorithms for TOP, and three algorithms for HSF, as defined before the start of this study, were evaluated. The time required for each test was also analyzed.

Results: Values for area under the ROC curve ranged from 82.5%-93.9%. The largest area (93.9%) under the ROC curve was obtained with the FDT criteria, defining abnormality as presence of at least one abnormal location. Mean test time was 1.08 +/- 0.28 minutes, 2.31 +/- 0.28 minutes, and 4.14 +/- 0.57 minutes for the FDT, TOP, and HSF, respectively. The difference in testing time was statistically significant (P <.0001).

Conclusions: The C-20 FDT, G1-TOP, and 24-2 HSF appear to be useful tools to diagnose glaucoma. The test C-20 FDT and G1-TOP take approximately 1/4 and 1/2 of the time taken by 24 to 2 HSF.

38.- Johnson CA.
RECENT DEVELOPMENTS IN AUTOMATED PERIMETRY IN GLAUCOMA DIAGNOSIS AND
MANAGEMENT.
Curr Opin Ophthalmol 2002 Apr;13(2):77-84.
Discoveries in Sight Research Labs, Devers Eye Institute, Portland, Oregon, USA.

Recently, there have been several new developments in automated perimetry that have contributed to enhanced diagnosis and management of glaucoma. This paper will briefly review four of the latest advances in automated perimetry: (1) efficient test strategies that reduce the testing time and variability of automated perimetric testing, in particular, the Swedish Interactive Threshold Algorithm (SITA) and Tendency Oriented Perimetry (TOP) test strategies will be described; (2) Frequency Doubling Technology (FDT) perimetry, which has been shown to be a rapid, effective method of detecting glaucomatous visual field loss; (3) Short Wavelength Automated Perimetry (SWAP), which has demonstrated the ability to predict the onset and progression of glaucomatous visual field deficits; (4) The Multifocal Electroretinogram (mfERG) and the Multifocal Visual Evoked Potential (mfVEP), which provide an objective measurement of the visual field. Each of these techniques has presented distinct advantages for the diagnosis and management of glaucoma.

39.- González de la Rosa M, Arteaga V, Baca, Marta González-Hernández
GLAUCOMA DIAGNOSIS USING TENDENCY ORIENTED PERIMETRY
Pag: 157-163
University of La Laguna. Canary Islands. Spain

Purpose: Looking over the data from a previous research, (Ophthalmology. 2000; 107:134-142) we noticed that the MD had similar diagnostic ability in TOP than in Bracketing, but the LV was better that the MD in TOP and worst in Bracketing. We have studied the ability of several perimetric indexes using TOP.

Methods: a)139 visual fields from patients with glaucoma (mean MD=7.5dB, sd=6.7dBdB) and 89 normal subjects examined using TOP-32 and b) 65 glaucomas (mean MD = 6.1dB, sd=2.7dB) and 62 normal subjects examined with G1-TOP, were examined using ROC analysis and different criteria: [1] number of points deviated more than 5dB (NPP), [2] MD, [3] sLV (LV square root) and [4] an empirical criteria consisting on the presence of at least 3 out of 7 the following criteria NPP>2,
sLV>3dB, MD>6.7dB and sLV in areas S3,S2,I2 and I3 (Arch Soc Esp Oftalmol 77:87-94, 2002) higher than 2.55, 1.76, 2.15 and 2.55dB.

**Results:** The results of the TOP-32 study were: specificity 76.4, 65.2, 92.1, 93.5%, sensitivity 91.4, 79.1, 93.5, 97.8%, positive predictive value 85.8, 77.6, 93.5, 98.5%, negative predictive value 85.0, 66.7, 90.1, 90.6%. The results of the TOP-G1 study were: specificity 88.5, 87.1, 98.4, 92.3%, sensitivity 86.2, 89.2, 81.5, 93.5%, positive predictive value 88.9, 87.9, 98.1, 93.8%, negative predictive value 85.7, 88.5, 83.6, 92.1%.

**Conclusions:** Although LV values are lower in TOP than in Bracketing, its diagnostic ability is higher than that of the MD. The best results were obtained with the “3/7” index, that takes into account the regional LV at four nasal areas, corresponding to specific ganglion cell axon bundles.

40.- Mesa F, Aguilar J, Gonzalez-Hernandez M, González de la Rosa M
SECOND GENERATION OF THE TENDENCY ORIENTED PERIMETRY ALGORITHM IN GLAUCOMATOUS PATIENTS
University of La Laguna. Canary Islands. Spain

**Purpose:** To compare the results of the second generation of the Tendency Oriented Perimetry Algorithm that uses equations for the dependence of close and distant points specific in glaucoma (TOP Plus-G) with conventional Bracketing perimetry in Glaucoma patients.

**Methods:** 49 glaucoma patients at different stages of the disease were examined with both techniques using the Octopus 1-2-3 perimeter. One eye per subject was examined, previous perimetric experience was required and random order was used for the examinations.

**Results:** Correlation coefficient (and error of estimation of Y in relation to X) between both examinations was MD=0.97 (1.88dB), sLV=0.88 (1.21dB), MD (Supero Nasal) =0.97 (2.42dB), MD (Infero Nasal) =0.95 (2.60dB), MD (Supero Temporal) =0.93 (2.89dB), MD (Infero Temporal) =0.96 (1.98dB), local thresholds=0.84 (5.51dB). Mean MD value was 11.23 (sd=7.48dB) for TOP+ and 11.59 (sd=7.48dB) for Bracketing (p=0.41). Mean sLV value was 5.73 (sd=2.6dB) for TOP+ and 5.72 (sd=2.51dB) for Bracketing (p=0.49). RMS error for TOP+ in relation to Bracketing increased from 3dB for MD=0dB to 8dB for MD=15dB. In cases with nasal steps, TOP+ precisely delimited the border of the defect, without invading the opposite quadrant.

**Conclusions:** TOP+ produces results that are equivalent to TOP with better delimitation of the borders of the nasal step. As opposed to TOP, TOP+ tends to give LV results equivalent to those given by Bracketing.

41.- Dannheim F.
Fast ‘TOP’- and normal bracketing strategy in glaucoma.
Department of Ophthalmology, General Hospital Harburg, Hamburg, Germany.

**Purpose:** Comparison of visual fields with different degrees of glaucomatous alterations, obtained with both strategies, by duration, reproducibility, conformity, mean defect (MD), loss variance (LV), and by inspection.

**Methods:** Visual fields of 27 glaucomatous eyes of 21 subjects were examined twice with the normal bracketing and twice with the TOP strategy of the OCTOPUS 1-2-3 perimeter in variable order using program G 1 X. The fields included 4 borderline, 5 mild, 5 moderate and 13 severe defects.

**Results:** Duration with the normal strategy was 11.2 + 0.68, with the TOP strategy only 2.25 ± 0.18 minutes - a gain in time of 80 ± 2 %. Reproducibility for each of the two strategies, calculated as short-term fluctuation (SF), is for the normal strategy 4.04 ± 1.05, for TOP 4.19 ± 1.23. Three eyes with borderline or mild defects had a considerably larger SF for TOP. Reproducibility as correlation coefficient of relative sensitivity values within each strategy is in moderate or severe alterations for both strategies in the same order with values around 0.8 except for one outlier. Conformity of results for both strategies, calculated as SF between the mean values of relative sensitivity for either strategy, is 3.93 ± 0.94, slightly smaller than the within-strategy SF. Conformity as correlation coefficient between mean values of relative sensitivity for either strategy is in eyes with moderate and severe defects in the range of 0.81 to 0.91 (0.84 + 0.09). The independent regression line of this correlation shows a slope of 0.82 to 0.91, an intercept of 0.35 to 2.93. TOP apparently levels the different defect values mildly reducing LV, whereas MD is equal for both. Inspection shows an excellent to reasonable good coincidence of fields for both strategies in all cases. Fields with moderate or severe defects agreed better than lesser-affected ones. The 4 most deviating results are presented, their short-term fluctuation lies well within the long-term fluctuation.

**Conclusions:** The TOP strategy saves 80% of examination time thus avoiding fatigue. This fast threshold method proved sufficiently reliable for a routine application in glaucoma. A slight attenuation of defect values
with TOP calls for a continuous application in follow-up examinations.

42.- Morales J., Sawyer C., Freedman A.S., Abdul-Rahim A.S.
FASTPAC 30-2 vs. TOP-32 in neuro-ophthalmological defects.
Texas Tech University HSC-KKESH, Saudi Arabia
**Purpose:** To compare the results obtained with Fastpac 30-2 and TOP-32 in patients with neuro-ophthalmological abnormalities.

**Methods:** 22 patients referred to the neuro-ophthalmology service underwent both tests the same day. Comparison of global indices, localization of defects and agreement regarding topographic diagnosis was made.

**Results:** 43 pairs of visual fields from patients with a variety of neuro-ophthalmological disorders were evaluated. Mean time per eye was TOP: 2:29; Fastpac: 9:34. Correlation coefficient was 0.92 (STEYX 2.57) for mean deviation-mean defect (MD). Absolute difference in MD estimation was less than 3.6 and 9 dB in 79, 91 and 100% respectively. Excellent agreement between both strategies was estimated in 11 patients, moderate agreement in 9 and poor agreement in 2. Topographical correlation of the defect corresponded accurately with the defect found by traditional threshold testing especially in those cases with a well-defined defect. TOP "smoothed" the edges of sharp scotomas and produced less profound scotomas than Fastpac as describes previously.

**Conclusions:** TOP is capable of detecting abnormalities and to map out accurately well-defined neuro-ophthalmological type of field defects. The smoother edges and shallower scotomas observed with TOP do not seem co impair the ability to make a topographic diagnosis of well-defined lesions. Neurological patients might benefit from a short test.

43.- Morales J., Brown S.S.
TOP PERIMETRY IN CHILDREN WITH OCULAR ABNORMALITIES.
Texas Tech University Health Sciences Center, Department of Ophthalmology, Lubbock, TX.
**Purpose:** To assess the usefulness of TOP-32 strategy in children with ocular abnormalities.

**Methods:** Subjects were recruited in a consecutive fashion from cur pediatric ophthalmology clinic. Thirteen healthy, neurologically normal children with congenital or acquired abnormalities of the globe or optic nerve of one or both eyes were included. The TOP-32 program on the Octopus, 1-2-3 perimeter was performed twice on each eye. We compared the visual field defect(s) with the -anatomic lesion(s), looking for correlation between the predicted and actual scotomas in terms of location, depth and reproducibility.

**Results:** The mean test duration was 2:41 seconds (median 2.29sec). A good to moderate correlation between the anatomic abnormality and the visual field abnormality was found in 11 out of 13 patients. Agreement between visual field results and clinical abnormality was higher in patients with unilateral disease and/or a well-defined anatomic defect.

**Conclusions:** TOP perimetry is useful Lo detect visual field defects in children with abnormalities of the eye or optic nerve. Test time per eye is under 3 minutes. In a typical clinical setting, a short TOP-32 test performed twice on each eye seems adequate to obtain useful information without boredom or fatigue invalidating the results. Anatomically well-defined ocular abnormalities and/or unilateral disease seem to he easier to characterize and interpret

44.- Capris P., Corillo G., Torre P., Camisione P., Nasciutt F, Papadia M, Biasotti B.
Comparison of TOP strategy (Octopus) and SITA Fast (Humphrey) algorithm in damaged visual fields.
Department of Neurological and Visual Sciences - Ophthalmology Unit, (University of Genoa, Italy). Department of Health Sciences - Biostatistic Unit (University of Genoa, Italy).
**Purpose:** The SITA Fast algorithm of the Humphrey Field Analyser and the TOP strategy of the Octopus perimeter can be considered the shortest available perimetric strategies in fast threshold testing. The algorithms of the two strategies are quite different. The reproducibility (Inter-test variability) and the inter-algorithm differences were evaluated in damaged visual fields.

**Methods:** Twenty eyes of twenty patients (aged 25-68 years) with damaged visual fields (MD > 8 dB) were examined in two sessions. In the first session each patient was tested with the 32 Program TOP Strategy (Octopus 101 Perimeter, Interzeag Ag). In the same session, after 30 minutes testing time, a second examination was carried out with the central 30-2 program SITA Fast strategy (750 II HFA, Zeus
Instruments). The order of the examinations was randomised. A second session was performed 3 days later, with the same procedure, in reverse order.

**Results:** The average inter test point-wise sensitivity difference for the TOP strategy was lower than for the SITA Fast one (-0.658 dB for TOP and -0.7178 dB for SITA Fast) The mean sensitivity error between the first session of SITA Fast and the full threshold HFA strategy (-1.5666 dB) was significantly higher. (p<0.01) that the error between TOP and the Octopus full threshold strategy (-0.874 dB). The testing time for the TOP strategy (153 sec.) was 57.98 % lower than the SITA Fast (363 sec). Both strategies reduce testing time (64% S ITA Fast, 84% TOP). SITA Fast showed a higher mean sensitivity compared to TOP (+2.959 dB). TOP offers better precision and shorter test duration (the average testing time is almost half, compared to SITA Fast), whereas SITA Fast is characterized by better test-retest reproducibility.

**Conclusion:** although the differences between the two ultra-short strategies are statistically significant, they are not clinically manifest. The time saving obtained by TOP or SITA Fast is due to a lower accuracy. These strategies represent an important progress in perimetry, as they realize reliable visual fields with a great time saving.

45.- González de la Rosa M (1), Morales J (2), Dannheim F (3), Papst E&N (4), Seiler T (5), Demailly P (6), Lefrançois A (7), Matsumoto C (8), Kirstein R (9), Mermoud A (10), Pruente C (11).

Background. The G1-TOP program is a short automated perimetric strategy which sub-divides the G1 grid of 59 points into four sub-grids. Each point is tested only once, but each patient’s response is used to modify that particular point and the surrounding ones from the remaining sub-grids. This study was conducted to compare the results of the G1-TOP program with the Standard Bracketing strategy.

Methods. Eleven participating institutions provided data from 213 patients (406 eyes): Main group consisted of 284 glaucomas and 55 glaucoma suspects. Other sub-groups included 31 eyes with neurological disorders, 20 with chorioretinal lesions and 16 normal eyes. Mean age was 62.7 ± 15.4 (range 14-88 years). All subjects had previous perimetric experience and a visual acuity better than 0.5. Examination included G1-Standard Bracketing and G1-TOP testing, interchangeable order, with the Octopus 1-2-3 perimeter.

Results. Correlation coefficient for Mean Defect was 0.95. Standard error (YX) for Mean Defect, square root of Loss Variance and individual thresholds were 1.86 dB, 1.29 dB, and 4.72 dB, respectively. Mean Sensitivity values were similar (difference: 0.04 ± 1.87 dB) (p>0.05). Mean duration for G1-TOP was 2:19 ± 0.26 min., while G1-Standard Bracketing took 11:51 ± 1.52 min. (relation 1/5.1, or a net reduction of 80.4%). Sensitivity of G1-TOP versus G1-Standard Bracketing was: glaucoma 77.1/78.5, glaucoma suspects 38.2/47.3, neurological disorders 87.1/87.1 and chorioretinal lesions 80.0/85.0.

Conclusion. G1-TOP program produced very similar results to G1-Standard Bracketing in only 20% of the time required by the Standard Strategy.

46.- Anderson AJ.

Discoveries in Sight, Devers Eye Institute, Portland, Oregon 97232, USA. ajanderson@hotmail.com

**Purpose:** Tendency-oriented perimetry (TOP) is a new strategy designed to estimate the sensitivity of the visual field quickly, by using linear interpolation between test locations. This study determined the spatial resolution characteristics of TOP.

**Methods:** A Monte-Carlo technique was used to simulate visual fields, and incorporated realistic amounts of subject response variability as well as variability in the average sensitivity of the field. Visual field defects of various depths, ranging from a single point through to 18 contiguous points, were added to the simulated fields. An estimate of the visual field was made using the TOP algorithm. Global indices (mean deviation [MD] and loss variance [LV]) were calculated for both the true visual field and the TOP estimate. **Results:** For small defects of one or two points, the TOP algorithm typically overestimated sensitivity. Sensitivity estimates tended to stratify into one of two possible values, with the lower value being dependent on the absolute position of the defect within the visual field. Although MD was satisfactorily predicted by TOP, LV was underestimated and reached a plateau when defects were deep, especially with smaller defects. For
relatively large defects of nine contiguous points, both defect depth and LV was predicted with reasonable accuracy by TOP. The TOP sensitivity estimate for normal locations surrounding a defect was systematically reduced.

**Conclusions:** The TOP procedure has a number of unusual spatial characteristics that prevent it from accurately estimating the spatial extent and absolute sensitivity of visual field defects.

47.- Gonzalez de la Rosa M
THE A.J. ANDERSON TOP ALGORITHM SIMULATION
IOVS on line. ([http://www.iovs.org/cgi/eletters?lookup=by_date&days=60](http://www.iovs.org/cgi/eletters?lookup=by_date&days=60)).

About the paper published in IOVS in May 2003 by A.J. Anderson, entitled Spatial Resolution of the Tendency-Oriented Perimetry Algorithm (TOP), I would like to question the originality of the design of the study, the validity of the methods, and its results and conclusions.

The paper is not original and it describes a well known LV reduction using TOP that has been analyzed by other papers and simulation procedures.

The method used in this study is not correct because the algorithm used by the author is an incomplete and incorrect version of the real one, and because the visual field defects used by the author are arbitrarily created and are not similar to those encountered in clinical practice, ignoring the physiopathological relations between glaucomatous defects.

The limitations of the simulation used by Anderson can be highlighted by the opposite results of several clinical studies evaluating the value of LV-TOP, in which this perimetric index has been shown to have the best diagnostic ability in glaucoma, even better than those indexes given by the conventional strategy.

The conclusions of the paper are completely unjustified. The only conclusion that can be derived is that when a simulation contradicts the real experience, what is to be questioned is the simulation model and not reality.

48.- Gonzalez de la Rosa M1 MD, PhD, Gonzalez-Hernandez M1 OD PhD, Garcia Feijoo J2 MD, PhD, Morales J3 MD, PhD, Azuara-Blanco A4 MD, PhD, FRCS(Ed)
GLAUCOMA DIAGNOSIS USING THE FAST STRATEGY TENDENCY ORIENTED PERIMETRY (TOP) (Publication pending)
From the Department of Ophthalmology. Hospital Universitario de Canarias. Universidad de La Laguna. Spain (1); Instituto Castroviejo. Universidad Complutense. Madrid. Spain (2); Glaucoma Service, Department of Ophthalmology and Visual Sciences, Texas Tech University Health Sciences Center, Lubbock, Texas, USA (3); Aberdeen Royal Infirmary, University of Aberdeen, Aberdeen. UK (4).

**Purpose:** To evaluate the diagnostic capability of a fast perimetric strategy, Tendency Oriented Perimetry (TOP) using the indices Mean Defect (MD), Loss of Variance square root (sLV) and the number of pathological points (NPP), in patients with glaucoma.

**Methods:** Two-hundred and ninety-five eyes from normal subjects and 414 eyes from glaucomatous patients with early (MD<6dB; n = 179), moderate (MD 6-12dB; n = 112), or advanced (MD>12dB; n = 123) visual field loss were examined at four academic institutions, utilizing the Octopus 1-2-3 perimeter and the TOP program. Receiving Operating Curves, sensitivity (Se) and Specificity (Sp) were calculated. Logistic regression analysis, discriminant analysis, regression trees and correction of the NPP value by cluster analysis were applied.

**Results:** In early glaucoma, the best diagnostic index was sLV (Sp=90.2, Se=84.9, ROC area=0.972) followed by NPP (Sp=84.7, Se=80.4, ROC area=0.934) and MD (Sp=80.0, Se=70.4, ROC area=0.921). In moderate and severe glaucoma, MD was the best diagnostic index: moderate (Sp=98.0, Se=100, ROC area=0.998) and severe (Sp=100, Se=100, ROC area=1.0). A cut-off point for sLV=2.66dB achieves Sp=96.3, Se=90.6, while sLV=2.45dB gives the best balance between Sp (91.9%) and Se (92.8%) for the whole sample.

**Conclusions:** In this large population studied with the fast strategy TOP, the sLV index was the most useful discriminator between glaucomatous and normal eyes.

49.- Gonzalez-Hernandez M1 OD, PhD, Morales J2 MD, PhD, Azuara-Blanco A3 MD, PhD, FRCS(Ed), Garcia Sanchez J4 MD, PhD, Gonzalez de la Rosa M1 MD, PhD
COMPARISON OF DIAGNOSTIC ABILITY BETWEEN A FAST STRATEGY, TENDENCY ORIENTED PERIMETRY (TOP), AND THE STANDARD BRACKETING STRATEGY
From the Hospital Universitario de Canarias. Universidad de La Laguna. Spain (1);
Objectives: To compare the diagnostic abilities of the standard Bracketing strategy (BR) and a fast strategy, the Tendency Oriented Perimetry (TOP).

Methods: Seventy-seven controls and 91 eyes from patients with glaucoma were analyzed with the strategies TOP and BR. Sensitivity (Se), specificity (Sp), the area under the Receiver Operating Characteristic (ROC) curve (CA) and the optimum cut off value (CO) were calculated for the visual field indices Mean Defect (MD), the square root of the Loss Variance (sLV) and the number of pathological points (NPP).

Results: In the glaucoma group, mean MD value by TOP and BR was 7.5dB and 8.3dB respectively. The mean sLV value by TOP and BR was 5.0dB and 5.3dB respectively. Indexes provided by TOP had higher ROC values than the ones provided by BR. Using TOP the index with the best diagnostic ability was the sLV (Sp=94.8, Se=90.1, AC=0.966, CO=2.5), followed by NPP and MD. Using BR, the best results were the MD (Sp=92.2, Se=81.3, AC=0.900, CO=2.5) followed by the sLV and NPP.

Conclusions: A fast strategy, TOP, had superior diagnostic ability than the standard BR. Although TOP provided lower LV values than BR, the diagnostic ability of this index was higher than that of the conventional strategy.

51. Kratochvilova P.
[Computer Perimetry--Rapid TOP (Tendency Oriented Perimetry) and Normal Threshold Methods in Clinical Practice--Comparison of Results]
[Article in Czech]
Computer perimetry is constantly being developed but still remains a subjective examination method. The patient's cooperation plays an important part and therefore examination strategies are improved to make it possible to obtain the most accurate possible results during the shortest possible examination time. The author presents an account on the comparability of results of rapid TOP strategy (Tendency Oriented Perimetry) and normal threshold strategy with programme G2 on the perimeter OCTOPUS 101. It involves the retrospective evaluation of 73 visual fields which were divided into four groups according to the achieved retinal sensitivity during examination with TOP strategy and with normal threshold strategy. The author compared the obtained parameters MD and LV, she compared the sites of defects of retinal sensitivity in both strategies and calculated the time saved by rapid TOP strategy. High comparability was achieved in group 1 with normal retinal sensitivity in both strategies and also in group 4 with abnormal retinal sensitivity in both strategies. In groups 2 and 3 comparability was not proved (group 2--abnormal retinal sensitivity in TOP and normal retinal sensitivity in normal threshold strategy, group 3--normal retinal sensitivity in TOP and abnormal retinal sensitivity in normal threshold strategy). In these groups we may assume a higher ratio of the so-called learning effect or conversely fatigue and poorer cooperation of the patients during the lengthy examination by normal threshold strategy. The localization of defects agreed in group 4 in 83.3% and in the
other groups it was not compared (group 1 practically without defects, in groups 2 and 3 the results were not comparable). The total time saved with TOP strategy was 75.8%, the mean examination time with TOP strategy was 3 minutes 27 seconds, with normal threshold strategy 14 minutes 17 seconds. With regard to the significant time saving the programme G2 with TOP strategy can be considered suitable for patients with glaucoma, with intraocular hypertension and with suspected glaucoma but it can be also used as a screening method with quantitative results for other situations.

FULLY AUTOMATED KINETIC PERIMETRY AS AN ALTERNATIVE TO STANDARD STATIC AND KINETIC PERIMETRY
Department of Neurology, University of Pennsylvania, Philadelphia, PA.
Purpose: Choices for formal visual field testing currently consist of automated static or manual kinetic examinations. It would be advantageous to create a standardized test that combines the benefits of both forms of perimetry, and that does not require a skilled perimetrist. Our goal was to design a fully automated test on the Octopus 101 perimeter that merges a short central static examination with a computer-driven peripheral kinetic examination, and to compare its results to standard perimetric methods.
Methods: 56 neuro-ophthalmology or glaucoma patients (74 eyes) who had prior static (37 eyes) or kinetic (37 eyes) perimetry underwent testing. The test consisted of a tendency-oriented perimetry (TOP) examination that was completed first, and then overlain upon isopters delineated by a pre-programmed kinetic examination. Individual reaction time was calculated and used to correct the kinetic isopters. Three physicians, using a modified version of the OHTS trial classification scheme, classified the visual fields blindly and independently. The pairs were considered a match if the consensus analyses matched.
Results: Of the 74 eyes, 37 were glaucoma (17 static, 20 kinetic) and 37 (20 static, 17 kinetic) were neuro-ophthalmology patients. Visual field pairs were classified as a match in 84% of the eyes with static comparisons and 78% of the eyes with kinetic comparisons. Upon inspection by a fourth grader, the non-matching sets largely consisted of visual fields for which a consensus was not reached, but that conveyed similar information. One subtle nasal step was detected by the kinetic component of the Octopus test that was missed by our Goldmann perimetrist. However, our perimetrist delineated small central scotomata in 2 glaucomatous eyes that were not delineated by the Octopus static component. Furthermore, there were 3 eyes in which a paracentral scotoma was slightly smaller on the Octopus test than on standard static testing. Patient preference was dependent upon the type of prior examination - patients preferred the Octopus test to standard static tests, but preferred manual kinetic testing overall.
Conclusions: An unskilled technician can use the Octopus 101 as a method to combine static and kinetic perimetry in neuro-ophthalmology and glaucoma patients with complex visual field defects. Further studies are necessary to define its utility in patients with small central scotomata, and to determine whether this method is superior to static perimetry as a screening tool and for long-term follow-up.

53.- S Okuyama, S Hashimoto, C Matsumoto, E Arimura, S Takada and Y Shimomura.
Reliability of the catch trials in automated perimetry.
Department of Ophthalmology, Kinki University School of Medicine, Osaka-Sayama, Japan
8th International Octopus Symposium, Thun, 2004
Purpose: To assess the utility of reliability indices in standard and time-saving automated perimetric threshold tests in normal subjects who were forced to make wrong responses in fixed rates.
Methods: Seven normal experienced subjects who understood the strategies of automated perimetry were tested in one eye using the Humphrey Visual Field Analyser 750 (HFA II) program 30-2 with full threshold (FT) SITA standard (SITA-S) and SITA fast (SIT A-F) strategies, and the Octopus 101 program 32 with normal (NS) dynamic (DS) and TOP strategies. In each test, they were forced to make correct answers as usual or to make either false-positive (FP) or false-negative (FN) responses in a fixed ratio of 33% or 20%. We analyzed the reliability indices and the perimetric assessments including the global indices.
Results: In the results of the forced FN response tests, the rates of FN responses were underestimated and were less than 20% with SITA-S and SITA-F in all subjects. In the results of the forced FP response tests using the HFA II, fixation losses were counted high under the Heijl-Krakau method and the rates of FP responses were estimated variously among the subjects. In the results of the tests with TOP, the rates of FP and FN responses were one of 0%, 25% and 50% because the number of catch trials in a test was only four. The reliability indices with DS were similar to those with NS.
Conclusions: The reliability indices with time-saving strategies should not be assessed in the same way as the standard threshold strategies, NS or FT. Especially the false-negative response rates with SITA strategies should be estimated carefully if those were not so high.
TOP sLV - a very sensitive indicator in visual field diagnosis
University of La Laguna, Spain
8th International Octopus Symposium. Thun, 2004

It is well known that the TOP strategy reduces the LV value in comparison to the conventional strategy. We recently carried out a study on 91 glaucoma and 77 control subjects examined with TOP and Full Threshold. We observed that the square root of the Loss of Variance (sLV) has maximum diagnostic capability with TOP (LV cut-off = 7.1 dB2 or sLV = 2.66dB). This capability is much higher than that of the mean defect or the number of pathological points, which are the best indices in conventional perimetry. A new multicenter study carried out on 414 glaucoma and 295 normal subjects and comparative studies between TOP-WW, FDT, PULSAR and HRT II also confirmed TOP-sLV high diagnosis capability. The reasons seem to be:

- Better correlation between the mean defect and loss variance.
- "Neurological fatigue effect" reduction.
- Limiting loss of attention.
- Avoiding "white scotomas"
- Acting as averaging system, avoiding impossible differences in interrelated areas.
- Achieving fluctuation reduction in threshold levels close to normality.

All this is summarized in better correlation between fluctuation and loss variance at the beginning of the disease.

As a conclusion, TOP achieves determination of neuronal malfunction in very early stages of glaucoma, probably previous to anatomical damage, by means of reducing methodology errors. TOP-sLV revealed a fluctuation increment without need of measuring via test-retest and confirmed that threshold fluctuation is the first perimetric sign of glaucoma damage (FLAMMER J., DRANCE S.M., ZULAUF M. Arch. Ophthalmol. 102: 704-706,1984).

55.- N R Rangaraj, M Ariga
Relevance of White on white Perimetry, A Comparison of Visual function by TOP with RNFL examination by GDx with VCC
Sundaram Medical Foundation, Chennai, India.
8th International Octopus Symposium. Thun, 2004

Aim: The study was undertaken to see if the RNFL (Retinal Nerve Fiber Layer) examination was superior or comparable to white on white perimetry done with TOP strategy on a 301 Octopus perimeter and justified additional expenditure on the GDx with VCC without significantly compromising the quality of diagnosis. Methods: 28 eyes with primary open angle glaucoma and 6 normal eyes underwent examination with GDx (Laser Diagnostic Technologies, Inc; Version 5.1.0) and TOP G1 program on an Octopus 301 perimeter (INTERZEAG, V5.01c). The retinal nerve fiber layer parameters and the global indices from TOP G1 program were analyzed. Results: The global index from the GDx, "The Number" and global visual field indices from TOP "LV and MD" were analyzed independently for correlations. It was observed that there was no statistically significant difference when LV (Loss Variance) and MD (Mean Defect) was compared with the GDx Index 'The Number'. The statistical methods employed for the analysis will be discussed with the results. Conclusions: The visual field indices MD and LV correlate well with the GDx index 'The Number', hence at the present time white on white perimetry is still relevant for diagnosis and follow up.

56.- Nicholas J. Volpe, Stacy L. Pineles, Eydie Miller-Ellis, Steven L. Galetta, Prithvi S. Sankar, Kenrieth S. Shindler, Maureen G. Maguire.
Automated Kinetic and Static Perimetry: An Alternative to Standard Examinations
Scheie Eye Institute, University of Pennsylvania School of Medicine. Department of Ophthalmology; Philadelphia, PA
8th International Octopus Symposium. Thun, 2004

Objectives: To create a fully automated perimetry program combining a static examination with a kinetic test, and to compare this test to standard static and kinetic visual fields (VFs).

Methods: Fifty-six patients (74 eyes) presenting for neuro-ophthalmic or glaucoma evaluation that had standard static or kinetic perimetry underwent testing. A Tendency-Oriented Perimetry (TOP) examination was overlaid upon a VF delineated by a pre-programmed kinetic examination. Three physicians classified all of the VFs blindly and independently. VF pairs were considered a match if the consensus descriptions of the standard and automated, combined VFs matched.

Results: Thirty-seven eyes were neuro-ophthalmic (20 static, 17 kinetic) and 37 (17 static, 20 kinetic) were glaucoma patients. Thirty-two (86%) of the neuro-ophthalmic and 28 (76%) of the glaucomatous
pairs matched. Upon inspection by a fourth reviewer, many of the "non-matching" pairs were those for which a consensus was not reached, but still conveyed similar information. Two glaucomatous eyes demonstrated central schoolmate not delineated by the automated combined examination. Two subtle nasal steps were detected solely by the automated, combined examination. The automated, combined test ranged in time from 6-12 minutes per eye.

**Conclusions:** The Octopus 101 perimeter combines the advantages of static and kinetic perimeter, and produces equivalent results, while not requiring examiner expertise.

57. - Nicholas Volpe, Stacy L. Pineles

Octopus Computerized Static and Kinetic Perimetry in the Detection of Non Organic Vision Loss

Scheie Eye Institute, University of Pennsylvania School of Medicine. Department of Ophthalmology; Philadelphia, PA

**Objective:** To use the Octopus 101 automated static and kinetic perimeter as a method of diagnosing FVL for generalized visual field constriction and non-physiologic hemianopias.

**Methods:** Ten patients (twelve eyes) who demonstrated generalized constriction underwent testing combining computerized kinetic perimeter with visual field expansion by a reversed Galilean telescope. Six of these eyes were diagnosed with FVL, while six others had physiologic disease. Computerized static and kinetic perimeter was also used for 8 patients with physiologic hemianopias, 12 healthy volunteers coached to simulate hemianopias, and 2 patients with non-physiologic hemianopias.

**Results:** The 6 patients with physiologic generalized visual field constriction demonstrated the expected average expansion of their visual fields of 1.7X with the use of a reversed 2X Galilean telescope. However, all 6 of the FVL eyes demonstrated "tubular" visual fields, with an average reduction of visual field size by 0.8X. Of the hemianopia patients, the normal volunteers demonstrated the strongest midline respect on the kinetic component and the most striking sensitivity difference between the two visual field halves on the static component. A peculiar phenomenon of "bowing" into the blind field in the periphery was noted in 6 of these 12 patients, and in none of the true hemianopia or true FVL hemianopias. The 2 FVL patients and the 8 patients with true disease did not reveal as striking a midline respect or sensitivity difference as did the normal volunteers.

**Conclusions:** Tubular visual fields in patients with non-organic generalized constriction can be demonstrated using computerized kinetic perimeter and a reversed Galilean telescope. Patients with non-organic hemianopias may be able to "fool" computerized kinetic and static perimetry; however, their visual fields are not identical to those of normal volunteers coached to simulate these defects or those with true hemianopias.

58.- Devindra Sood

Specificity and Sensitivity of Confocal Scanning Laser Ophthalmoscopy in Early Glaucoma

Delhi Ophthalmological Society, India

**Purpose:** To study the specificity of the scanning laser ophthalmoscope (HRT- II) in a normal population and also assess its ability to identify cases in perimetrically defined early glaucoma.

**Methods:** The study was conducted in two parts. Optic nerve head of consecutive, randomly selected normal subjects was imaged on the HRT-II. Fifty patients with a perimetrically defined early glaucoma were also imaged. Results of Moorfields Regression Analysis and discriminant functions were recorded.

**Results:** The average size of the disc amongst normals was 2.24 +/- 0.42 mm². Moorfields Regression analysis ( MRA ) had a specificity of 84.24% and 92.72% depending on the criteria used to define an abnormal disc . The RB (R. Bathija) and FSM (F.S Mikelberg) function had specificity of 97.58 and 86.1% respectively . Amongst the perimetrically defined glaucoma population sensitivity was 83.3% based on MRA . FSM and RB discriminant function had a sensitivity of 64.3% and RB of 14.3% .

**Conclusions:** MRA and discriminant functions had a high specificity in our normal population. However in a perimetrically defined early glaucoma, the discriminant functions did not have a high sensitivity .

59.- Gonzalez de la Rosa M

Estrategia TOP y perimetría PULSAR en el diagnóstico precoz del Glaucoma

Congreso de la Sociedad Mexicana de Oftalmología. Veracruz. 8 de Agosto de 2004.

60.- Elena SORLI(1), Manuel GONZALEZ DE LA ROSA(2), Antonia FONS(3), Jose Manuel GONZALEZ-DARDER(4).

Transitory functional defects showed by Tendency Oriented Perimetry (TOP) in patients with mild brain trauma.
IPS meeting. Barcelona. 2003

**Purpose:** To analyze the visual field in mild brain trauma (MBT).

**Methods:** 36 patients (Glasgow Coma Scale among 13-15, without pathology in Computer Tomography, loss of consciousness less than 30 minutes and amnesia less than 24 hours), were examined using the TOP strategy three times (twice a week after the traumatism and once three months later). The results were compared with 36 normal controls examined twice.

**Results:** The MD and LV square root (sLV) were significantly higher in the first two examinations (MD = 3.1 and 4.0dB, sLV = 2.8 and 2.9dB) than in the third one (MD = 1.0dB, sLV = 1.9dB) (p<0.01). There were no differences between the MD and sLV of the third exam of the MBT group and the two examinations of the control group (MD = 0.6 and 0.7dB, sLV = 1.9 and 1.8dB) (p>0.05), indicating a complete recovery. The test-retest threshold fluctuation of the MBT group (3.2 +/- 2.9dB) showed a highly significant difference with regard to the control group (1.2 +/- 1.2dB) (p<0.01). 28.9% points presented relative scotomas in the first two examinations in MBT group. 52.1% were reproduced in the same position in both examinations and 48.2% coincided in homonymous position.

**Conclusion:** A diffuse and transitory deterioration of the visual sensitivity with some certain specific topographical preferences was detected in these patients.
TOP FLICKER

F-1.- Manuel González de la Rosa, Javier Rodriguez, Manuel Rodriguez.
FLICKER-TOP PERIMETRY IN NORMALS, PATIENTS WITH OCULAR HYPERTENSION AND EARLY GLAUCOMA.
University of La Laguna. Spain

**Purpose:** To evaluate sensitivity, specificity and the capabilities to diagnose early glaucoma utilising the TOP algorithm adapted to Flicker Perimetry.

**Methods:** A regular TOP program for Octopus 1-2-3 was modified using the examination protocol proposed by Matsumoto et al as follows: Grid type “32”, background 31.5 asb, size Goldmann III, constant intensity of 4.000 asb, sampling time of 1 second and variable frequency. Taking into account the normal values described by this author and those regularly used by the perimeter, stimuli were generated using a value denominated “dB-Flicker equivalent”. Each dB was equivalent to 1.25 Hz, but no other modifications were made to the TOP strategy. Forty five eyes of 45 normal subjects were examined (17 with previous perimetric experience and 28 without it), 30 patients with ocular hypertension (normal TOP-standard visual field and optic nerve head) and 23 patients with early glaucoma (MD < 7 dB).

**Results:** Mean duration of the TOP-Flicker test was 4:01 ± 0:22 min. The results for Flicker-MD were: Normal -0.94 ± 1.67 dB; Ocular hypertension 6.58 ± 6.04 dB; Early glaucoma 9.37 ± 6.66 dB. The majority of the normal patients had normal results with TOP-Flicker (93.3% for MD < 2dB). Some of the normal subjects without perimetric experience had hyper-normal results (36% for MD < -2 dB). Twenty one (70%) eyes with ocular hypertension had pathological TOP-Flicker perimeter results (MD > 2 dB). Flicker perimetry results were abnormal in all of the early glaucoma cases and more abnormal than standard perimeter in 19 (82.6%) patients. The correlation between both types of perimeter was low (r = 0.39 for MD and r = 0.20 for LV) but was noted to be better in the Bjerrum’s area than elsewhere (r = 0.50). Point by point correlation was also very low (r = 0.25).

**Conclusions:** TOP-Flicker perimetry demonstrated a specificity of 93.3% and sensitivity of 100% for patients with early glaucoma. It classified 70% of eyes with ocular hypertension as pathological. Flicker perimetry might prove as a good screening system for earlier stages of glaucomatous damage.

F-2.-Rodríguez J, Cordobés L, Abreu A, González de la Rosa M.
TOP-FLICKER FLUCTUATION IN OCULAR HIPERTENSIÓN.

**Purpose:** The precocity of the TOP-Flicker defect in a big number of ocular hypertensive patients has previously been reported (Perimetry Update 1998-99). Our purpose now is to study the reproducibility of these defects.

**Methods:** 11 normal and 30 ocular hypertensive eyes were examined three times: once with luminous threshold perimetry (TOP-S) and twice with Flicker perimetry (TOP-F).

**Results:** All examinations showed MD<2dB and LV<6dB2 with TOP-S. With TOP-F one normal eye had abnormal MD and LV; 66.7% of the ocular hypertensive cases presented one of the indexes over the cut off level previously described. 36.7% of the cases had both indexes higher in both examinations. For 46% one of the indexes was higher in both examinations. The mean MD values were -0.34±1.1dB with TOP-S (range: –2.51 to 1.39dB) and 3.63±4.94dB with TOP-F (range: –2.47 to 17.07dB) (p<0.001). The mean LV values were 2.07±1.69 dB2 with TOP-S (range: 0.28 to 5.98dB) and 17.75±17.86 dB2 with TOP-F (range: 0.27 to 63.43) (p<0.001). Threshold fluctuation for TOP-F was 1.13±1.10dB (range: 0.05 to 3.70dB) for normal eyes and 3.62±2.17dB (range: 0.05 to 7.68dB) for the hypertensive cases (p<0.001). The fluctuation was highly correlated with the MD (r=0.66). For MD values of 0dB, fluctuation was 2.6dB and for MD=10dB it was 5.5dB. The correlation between the MD and the LV in TOP-S and TOP-F was low (r=0.17 and 0.20). The MD and sLV were well correlated in TOP-F (r= 0.83).

**Conclusions:** TOP-F was abnormal in half the ocular hypertensive eyes. Similarly to luminous threshold perimetry, threshold fluctuation in this procedure increases with the MD. Finally, the MD and sLV showed a close relation in TOP-F.

F-3.- García-Feijoo J, Gallardo Sánchez LM.
HALLAZGOS CON PERIMETRÍA DE PARPADEO Y ESTRATEGIA TOP EN PACIENTES CON
GLAUCOMA ASIMÉTRICO, HIPERTENSOS OCULARES Y POBLACIÓN NORMAL (FINDINGS USING FLICKER PERIMETRY AND THE TOP STRATEGY IN PATIENTS WITH ASYMETRIC GLAUCOMA, OCULAR HYPERTENSION ON NORMAL SUBJECTS).

76 Meeting of the Sociedad Española de Oftalmología. October, 2000. Award to the best investigation work.

Propose: To evaluate the results of flicker perimetry in patients with asymmetric chronic open angle glaucoma (SCG) and compare them with those of patients with ocular hypertension (OHT) and normal subjects.

Method: 20 normal eyes from 20 patients with SCG were studied (mean age 66.55 ± 8.2) using the Octopus G1 program. These patients had one normal eye (mean MD 0.03 ± 1.17) and showed a severe defect in the other (mean MD 13.64 ± 6.28). All patients underwent a full ophthalmological examination, including TOP flicker perimetry that was designed by Prof. Gonzalez de la Rosa for Octopus. 20 eyes from another 20 patients suffering from OHT (mean age 64.85 ± 7.90) with normal Octopus perimetry (mean MD 0.07 ± 1.22) and another 20 eyes from 20 normal subjects (mean age 66.4 ± 9.56) were also studied. Exclusion criteria were: VA<0.8, refractive error>3 spherical diopters and >1.5 diopters of astigmatism, pupil<3mm, ocular surgery or pathology, diabetes or neurological disease. U-Mann-Whitney was used for data analysis.

Results: The MD for flicker perimetry was –1.7 Hz (± 1.24) in normal subjects. In OHT patients MD was 2.18Hz (± 3.15) and in normal eyes of patients with asymmetric glaucoma the MD was 4.43Hz (± 4.58). The differences between the three groups were statistically significant (p<0.01).

Conclusion: Flicker perimetry can detect the onset of glaucomatous damage in some OHT with normal conventional perimetry and deeper defects in contralateral eyes of patients with advanced glaucomatous damage in one eye.

F-4.- Gallardo Sánchez LM, Aranguez Cortés C.

HALLAZGOS CON PERIMETRÍA DE PARPADEO Y ESTRATEGIA TOP EN POBLACIÓN NORMAL E HIPERTENSOS OCULARES (FINDINGS USING FLICKER PERIMETRY AND THE TOP STRATEGY IN PATIENTS WITH OCULAR HYPERTENSION AND NORMAL SUBJECTS).


Propose: To evaluate the results of flicker perimetry in patients with ocular hypertension and normal subjects.

Method: 34 eyes from 34 patients with ocular hypertension (mean age 53.44 ± 14.42) with normal Octopus G1 perimetry and 34 eyes from 34 normal subjects (mean age 52.50 ± 16.62) were studied. Full ophthalmologic examination was undertaken, including TOP Flicker perimetry designed by Prof. Gonzaúlez de la Rosa for Octopus. Subjects with best corrected VA<0.8, refractive error>3 spherical diopeters and >1.5 diopeters of astigmatism, pupil<3mm, ocular surgery or pathology, diabetes or neurological disease were excluded. The Student T test was used for comparison of independent samples as well as for data analysis.

Results: Mean MS in normal subjects was 39.97 Hz (± 2.19). Mean MS in patients with ocular hypertension was 30.60 Hz (± 4.41). The difference with normal subjects was statistically significant (p<0.01). Mean test duration was 3’33” (± 21”) in normal subjects and 3’50” (± 25”) in patients with ocular hypertension.

Conclusions: Flicker perimetry, using the TOP strategy, is a fast method for diagnosis and it allows the detection of initial damage in the visual field in some patients with ocular hypertension but with normal conventional perimetry.

F-5.- Rodríguez J, García M, González-Hernández M, González de la Rosa M.

NORMAL RELATIONSHIP BETWEEN LUMINOUS THRESHOLD AND CRITICAL FLICKER FUSION FREQUENCY


University of La Laguna. Canary Islands. Spain

Purpose: To establish the relation between Differential Luminous Thresholds (DLT) and the Critical Flicker Fusion Frequency (CFFF).

Methods: 28 eyes from 28 healthy subjects, with previous perimetric experience, mean age 34.7 years (sd=14.1) and refractive error lower than 3 diopeters (spherical equivalent) were examined twice using the Octopus 1-2-3 perimeter; once for measuring CFFF with Flicker perimetry (Background 31.4asb, stimulus...
Goldmann III at 4000 asb and 1 sec long) and another with conventional DLT perimetry. In both cases, the TOP strategy and grid 32 were used.

**Results:** A relation of 1 dB = 1.27 ± 0.03 Hz was obtained in the 74 examined points. Our previous estimation (Perimetry Update, 1993) had some local variability, with average deviations of 1.25 Hz from the normal CFFF values, underestimating them in the peripheral areas and mainly on the upper field. The relation is more uniform on the present sample. The deviation of the real local mean value from the estimated mean value is 0.6 Hz. The RMS error value between the CFFF and the estimated from the DTL on the 2072 examined points was 7.9 Hz. The CFFF loss with age (0.075 Hz/year) was equivalent to the loss for differential luminous thresholds (0.059 dB/year), with a ratio between them of 1.27.

**Conclusions:** There is a tight functional dependence between DTL and CFFF that, on the Octopus 1-2-3 and for the kind of stimulus used, is 1 dB = 1.27 Hz. This relation between both physiological functions happens to be more constant than what has been estimated so far using different samples of subjects.

F6.- Ochalik K, Zawojka I, Dudzinski A, Kinasz R.
Evaluation of flicker and W/W perimetry results performed in patients before and after cataract surgery.
1ST Department of Ophthalmology Silesian University of Medicine, Katowice, Poland
8th International Octopus Symposium. Thun, 2004

**Purpose:** The purpose of our study was comparison of wrw and CFF perimetry results in eyes with lens opacities before and after cataract surgery.

**Material and Methods:** Examinations were performed with single instrument -OCTOPUS 301 perimeter with Flicker Perimetry Option. Flicker Perimetry and W/W perimetry was performed in 45 patients (45 eyes) aged from 41 to 86 years (mean 65.3 years) (program G1, TOP strategy) with lens opacities. BCVA, IOP (Goldmann tonometry), time of examination, number of projected stimuli, number of false positive and negative responses were considered. False positive response was determined for frequency 100 Hz and false negative response for frequency 5 Hz. Visual fields were evaluated by MD and LV indices. In CFF perimetry the stimulus is always clearly visible. The criterion to answer is whether the stimulus is "solid" or flickering. Lens opacities were classified according to Chylack's scale LOCS III.

**Conclusions:** Perimetry CFF is a new diagnostic tool for early detection and follow up of visual field defects in patients with cataract and lens opacities. Patient's vision after cataract surgery and IOL implantation can be predicted. Examination time of CFF in patients with lens opacities is comparable to time used in standard W/W perimetry. Pre-examination training for the patient is obligatory.

F7.- Hisao Ohde, MD.
OCTOPUS flicker perimetry applied for a case of optic neuritis
Keio University, School of Medicine and Kamoshita Eye Clinic, Tokyo, Japan
8th International Octopus Symposium. Thun, 2004

**Purpose:** To record the OCTOPUS flicker perimetry for a case of optic neuritis and to compare the other perimetry method.

**Case:** A 30-year-old man, who had right optic neuritis was followed by the recovery course of the OCTOPUS flicker perimetry compared with Humphrey's static perimetry and Goldmann's kinetic perimetry.

**Result:** The OCTOPUS flicker perimetry could detect earlier in the recovery phase of optic neuritis than the other perimetry method.

**Discussion:** The optic neuritis caused central scotoma, and its visual field was recovered from the peripherally. This meant that the thin axons of retinal ganglion cells were easier damaged than thick ones in the optic neuritis, and the thin ones were more difficult in recovery than thick ones. The OCTOPUS flicker perimetry could be more sensitive to detect the thick neuronal activity than the other perimetry method.

F8.- Tomihiko Tanino
OCTOPUS flicker perimetry applied for ocular hypertension
Keio University, Tokyo, Japan.
8th International Octopus Symposium. Thun, 2004

**Background:** In the recent studies, up to 40% to 50% of nerve fibers could be 10St in the absence 01 a field defect. With these considerations in mind, many attempts have been made to disrupt detecting a field defect earlier than the ordinary perimetry in patients with glaucoma and ocular hypertension. The purpose of this study is to evaluate flicker perimetry applied for ocular hypertension.
**PATIENTS AND METHODS:** We investigated the thresholds for flicker perimetry in glaucomatous patients \((n = 6\) eyes of POAG and \(n = 22\) eyes 01 NTG) and in ocular hypertension patients \((n = 18\) eyes\). Visual fields were measured on Octopus 301 perimefer with option flicker perimetry on TOP and compared with standard white on white (W/W) perimetry in Humphrey Field Analyzer (HFA) program C30-2. An assessment of the results in upper hemi-fields and lower hemi-fields were made.

**RESULTS:** Out of 28 glaucomatous eyes, twenty-one eyes have field defects in flicker perimetry and fourteen eyes have field defects in HFA. On the other hand, out of 18 ocular hypertension eyes, only 10 have field defects in flicker perimetry and no ones in HFA.

**CONCLUSION:** Octopus flicker perimetry was superior to standard W/W perimetry in the detection of early changes of glaucomatous field defects in ocular hypertension.

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F9.- Itaru Kimura
Flicker perimetry of patients with visual field defect after encircling procedure
Keio University, Tokyo, Japan. Department of Ophthalmology Keio University School of Medicine
8th International Octopus Symposium. Thun, 2004

**Purpose:** To compare flicker perimetry and automated static perimetry to evaluate visual field defect (VFD) which was not correspondent to detached retina in a patient after encircling procedure (EC) for rhegmatogenous retinal detachment (RRD).

**Methods:** In a 24-year-old woman with VFD (infero-temporal defect) after EC for infero-temporal RRD of the right eye, we measured tissue blood flow in the fundus using a Heidelberg retina flowmeter and the measurements showed reduction of choroidal blood flow of affected eye. Electroretinogram showed low amplitudes of a-wave and the base value of electro-oculogram was clearly reduced in the right eye. This VFD was considered as the result of compromised choroidal circulation due to EC. Automated static perimetry (Octopus301, G1 program with tendency 6riented perimetry) and flicker perimetry (Octopus301, fG1 program with Tendency Oriented Perimetry) were measured.

**Result:** In the left eye (normal eye) the mean sensitivity (MS) of static and flicker perimetry showed 25.4dB and 39.6dB respectively. In the right eye (affected eye) the MS of infero-temporal quadrant (VFD area) of static and flicker perimetry showed 6.7dB and 6.6dB. The area that showed low MS of flicker perimetry was wider than that of static perimetry.

**Conclusion:** These results suggest that VFD after EC caused by dysfunction of outer retinal layer due to the disturbance of choroidal circulation may occur from the disturbance of magnocellular pathway.
PULSAR


Purpose: To measure normal thresholds for each age group, using stimuli that combine spatial resolution (SR) and contrast (C), shown as static, moving or pulsing in phase and counter-phase.

Methods: A CTR screen was used to show white round stimuli, 5° in diameter, 500 msec. long, shaped as a wave decreasing in amplitude, and with a mean luminance equal to that of the background. Stimuli increasing in difficulty, taken from a scale of 35 logarithmic combined units (cu), ranging from SR=0.5 cycl/deg and C=100% to SR=6.3 cycl/deg and C=6% were used. 56 normal subjects (one eye per patient) were examined twice with three stimulus types: static (CP-SW perimetry), centrifugal wave movement at 8 cycl/deg (CP-K6W), and pulse in phase and counter-phase at 30 Hz (CP-T30W) using the TOP strategy in the central visual field (30x24° of eccentricity).

Results: Mean examination time was 3:37 minutes. The difference between the thresholds in the central and peripheral visual field was higher than in conventional perimetry. This difference was particularly increased in the nasal field. The results for CP-SW, CP-K6W and CP-T30W were respectively: MS for 20 years 25.8, 25.3 and 24.7 cu; loss per year 0.108, 0.083 and 0.089 cu; threshold correlation coefficient with age (and error of estimation of Y over X) -0.68 (1.81cu), -0.68 (1.61cu) and -0.72 (1.66cu); threshold fluctuation between both examinations 2.38, 1.81 and 2.21cu; percentage of points deviated more than 5cu from the predicted value for the age 7.5, 5.9 and 6.7%.

Conclusions: Contrast perception, in relation to spatial resolution can be estimated in the visual field with a precision comparable to that of conventional perimetry, providing normal patterns with little dispersion, mostly with moving stimuli.


Purpose: We describe a new perimeter called PULSAR that makes use of stimuli that combine spatial resolution (SR) and contrast (C), shown as static, moving or pulsing in phase and counter-phase, and with the possibility of adding color.

Methods: A CTR screen was used to show white round stimuli, 5° in diameter, 500 msec. long, shaped as a wave decreasing in amplitude, and with a mean luminance equal to that of the background. The curve that relates contrast and spatial resolution was examined in 12 normal patients and in 66 locations of the visual field. In another 56 normal subjects (one eye per patient) were examined twice with three stimulus types: static (CP-SW perimetry), centrifugal wave movement at 8 cycl/deg (CP-K6W), and pulse in phase and counter-phase at 30 Hz (CP-T30W) using the TOP strategy in the central visual field (30x24° of eccentricity). Stimuli increasing in difficulty, taken from a scale of 35 logarithmic combined units (cu), ranging from SR=0.5 cycl/deg and C=100% to SR=6.3 cycl/deg and C=6% were used.

Results: Mean examination time was 3:37 minutes. The difference between the thresholds in the central and peripheral visual field was higher than in conventional perimetry. This difference was particularly increased in the nasal field. The results for CP-SW, CP-K6W and CP-T30W were respectively: MS for 20 years 25.8, 25.3 and 24.7 cu; loss per year 0.108, 0.083 and 0.089 cu; threshold correlation coefficient with age (and error of estimation of Y over X) -0.68 (1.81cu), -0.68 (1.61cu) and -0.72 (1.66cu); threshold fluctuation between both examinations 2.38, 1.81 and 2.21cu; percentage of points deviated more than 5cu from the predicted value for the age 7.5, 5.9 and 6.7%.

Conclusions: Contrast perception, in relation to spatial resolution can be estimated in the visual field with a precision comparable to that of conventional perimetry, providing normal patterns with little dispersion, mostly with moving stimuli.


Purpose: To measure the Contrast Sensitivity Functions (CSF) in the central visual field of normal subjects.
Methods: 20 eyes from 20 normal subjects were examined at 12 different spatial frequency (0.5 to 6.25 cycles/degree), to establish the CSF for each point in the visual field. The Tendency Oriented Perimetry (TOP) strategy was used on the Pulsar Perimeter. 66 points of the central visual field (30 nasal and temporal and 24 superior and inferior degrees) were studied.

Results: The CSF at different regions of the visual field fall in a parallel fashion, with higher spatial frequencies and eccentricity. Contrast thresholds fall slowly for low spatial frequencies between 0.5 and 1.25 cycles/degree. At 30 degrees of eccentricity, threshold values fall progressively for frequencies higher than 1.3 cycles/degree. The value for 6.25 cycles/degree in the nasal field is just 2.5% that at 0.5 cycles/degree. It goes down to 6.8% in the temporal visual field. The temporal inferior quadrant has a sensitivity 10% higher than the other three quadrants, with statistically significant differences for spatial frequencies between 0.5 and 2.5 cycles/degree (p<0.05 for Student t test).

Conclusions: The shape of Traquair’s island that represents contrast sensitivity depends on the spatial frequency used. It presents smooth slopes for low spatial frequencies and steep ones for high frequencies.

P-4.- González-Hernández M, Abreu A, Sánchez M, González de la Rosa M
Combined Spatial, Contrast and Temporal Function Perimetry in Early Glaucoma
University of La Laguna. Canary Islands. Spain
Purpose: To evaluate the diagnostic ability of a new perimetric procedure (Octopus Pulsar) that utilizes stimuli combining spatial resolution (SR), contrast (C) and motion or pulse, in early glaucoma.

Methods: Pulsar shows white round stimuli, 5° in diameter, 500msec long, shaped as a wave decreasing in amplitude, in 66 locations of the visual field. The stimuli scale combines SR and C in 36src units. 56 normal and 82 ocular hypertension and glaucoma eyes (one per subject) with Mean Defect (MD)<7dB in white-white Octopus 1-2-3 standard perimetry (WW) were included. Out of these 82 cases, 29 did not show WW perimetric defect (Level 0) and 53 were grouped in 3 levels, depending on the criteria used for perimetric diagnosis, being level 3 the group with worse visual field loss. Two stimuli types were used: one with centrifugal wave motion at 8cyl/deg (K6W) and another with pulse at 30Hz (T30W).

Results: Mean examination time was 3:49min. Specificities were 96.4% (T30W) and 94.6% (K6W) for a cutoff level of MD=3src. Sensitivities for Level 0 were 34.5% (T30W) and 24.1% (K6W). The Receiver Operating Characteristic (ROC) curve areas for T30W at Levels 1, 2 and 3 were 0.88, 0.94 and 0.99. Sensitivities were 69.8, 82.9 and 100%. The ROC areas for K6W were 0.83, 0.91 and 0.97. Sensitivity for Level 3 was 75%. There was good correlation between both Pulsar perimetries (r=0.88), but it was lower with WW (r=0.58 for T30W and r=0.59 for K6W).

Conclusions: T30W perimetry may show manifest glaucomatous damage earlier than conventional luminous threshold perimetry.

P-5.- Fernandez-Vidal A., García-Feijoo J, García-Sanchez J
PULSAR PERIMETRY: A NEW STRATEGY FOR EARLY GLAUCOMA EVALUATION (PRELIMINARY FINDINGS).
Hospital Clínico San Carlos, Madrid, Spain.
Purpose: To evaluate our first results with Pulsar perimetry in patients with ocular hypertension.

Methods: Pulsar perimetry is a new perimetric procedure which uses stimuli combining spatial resolution (SR) and contrast (C) for early glaucoma evaluation. The prototype examines visual functions which theoretically excite large ganglion cells: a temporal modulation program was used. We studied 35 left eyes of 35 patients with ocular hypertension and normal G1 Octopus perimetry (mean age: 59,63 SD 10,32) and 30 left eyes of 30 normal individuals (mean age: 49,17 SD 18,24). Exclusion criteria: visual acuity <0.8, refractive defect >3 spheric dp or 1,5 astigmatic dp, pupil size <3 mm, ocular surgery or pathologies, and non controlled diseases. They all had previous perimetric experience. Results were analyzed with student t-test.

Results: For normal individuals, mean sensitivity (MS) for Pulsar perimetry was 21,2 src (spatial resolution and contrast units) with an SD of 2,93. Mean defect (MD) was 0,9 src SD 1,94 and loss variance (LV) was 6,48 src DS 5,4. For patients with ocular hypertension: MS was 1,8,25 src SD 2,73; MD was 2,92 src SD 2,32 and LV was 9,3 src SD 5,8. MS, MD and LV differences between the two groups were statistically significant (p<0,05) with 95% confidence limits of (1,54; 4,36), (-3,08; -0,94;) and (-5,62-, - 0,24) respectively. Area under ROC curve obtained was of 0,78.

Conclusions: Pulsar perimetry may have greater sensitivity for the detector of early defects in patients with
ocular hypertension than conventional perimetry.

P-6.- Fernandez-Vidal A, García Feijoó J, González-Hernández M, González de la Rosa M, García Sanchez J.
PRIMEROS HALLAZGOS CON PERIMETRÍA PULSAR EN PACIENTES HIPERTENSOS OCULARES (INITIAL FINDINGS WITH PULSAR PERIMETRY IN PATIENTS WITH OCULAR HYPERTENSION).
Purpose: To evaluate our first results with Pulsar perimetry in patients with ocular hypertension and compare them with normal individuals.
Methods: We studied 34 eyes of patients with ocular hypertension and normal G1 Octopus perimetry (mean age: 57.29 S.D. 10.55) and 41 eyes of normal individuals (mean age: 48.34 S.D. 13.71). A complete ophthalmologic examination, including Dr. Gonzalez de la Rosa’s Pulsar perimetry with TOP strategy, was performed for all patients. Exclusion criteria: visual acuity <0.8, refractive defect 3 spheric dp or 1.5 astigmatic dp, pupil size <3 mm, ocular surgery or pathologies, non-controlled diabetes or neurological diseases. They all had previous perimetric experience. Results were analyzed with student t-test.
Results: For normal individuals, mean sensitivity (MS) for Pulsar perimetry was 21,25 src (spatial resolution and contrast units) with an S.D. of 2,70. Mean defect (MD) was 0,93 src S.D. 1,80 and loss variance (LV) was 6,11 src S.D. 4.30. For patients with ocular hypertension: MS was 18,65 src S.D. 2,79; MD was 2,73 src S.D. 2.30 and LV was 8,46 src S.D. 5.01. LV differences between the two groups were statistically significant (p<0.05) with 95% confidence limits of (-4.49; -0.20), and MS and MD differences, highly significant (p<0.01), with 99% confidence limits of (+0.92; +4.28;) and (-3.05; -0.54) respectively.
Conclusions: Pulsar perimetry may have greater sensibility for the detection of early defects in patients with ocular hypertension than conventional perimetry.

P-7.- C.Mendez-Hernandez1, J.García-Feijoó1, A.Fernández-Vidal1, M.González-Hernández2, R.Giménez1, J.Martínez de la Casa1, S.Aguilar1, J.García-Sánchez1, M.González de la Rosa1
PULSAR PERIMETRY AND NERVE FIBER LAYER ANALYSIS WITH LASER POLARIMETRY: COMPARATIVE STUDY IN PATIENTS WITH OCULAR HYPERTENSION
ARVO 2002 Authors/Institutions:. 1Ophthalmology, HC San Carlos. Instituto Ramón Castroviejo, Madrid, Spain; 2Ophthalmology, Hospital Universitario de Canarias., S/c tenerife, Spain; Hospital Universitario de Canarias., S/C de Tenerife, Spain.
Purpose: To study the relationship between the nerve fiber layer measured with laser polarimetry (GDx) and a new temporal modulation perimetry (Pulsar perimetry) in patients with ocular hypertension.
Methods: Pulsar perimetry is a new perimetric procedure which uses stimuli combining spatial resolution (SR) and contrast (C) for early glaucoma evaluation. Pulsar perimeter shows white round stimuli, 5º in diameter, 500 msec long, shaped as a wave decreasing in amplitude, in 66 locations. The stimuli scale combines SR and C in 36src units. A temporal modulation program with pulsing stimuli at 30 Hz in phase-counter-phase oscillations (program T-30W), which theoretically excites large ganglion cells, was used. We studied 28 eyes of 28 patients with ocular hypertension (mean age: 61,82 SD 9,90). Inclusion criteria: visual acuity >0.8, refractive defect 3 mm, no ocular surgery or pathologies and no uncontrolled diseases. All had previous perimetric experience. 5 parameters of the Laser Polarimeter (NFA II-GDx version 1.0.04) were studied: mean nerve fiber layer thickness at the superior and inferior quadrants (SQ-IQ), S/N, maximal modulation, mean ellipse thickness and ellipse’s modulation. Spearman's correlation coefficient was used to correlate such parameters with Pulsar's mean sensitivity (MS), mean defect (MD) and loss variance (LV).
Results: Correlations were as follows: between SQ-IQ and MS, r: 0,133 (p=0,681); with MD, r: 0,161 (p=0,681); and with LV, r:0,035 (p=0,914). Correlation between S/N and MS, r: 0,155 (p=0,431); with MD r: -0,148 (p=0,453); and with LV r: 0,188 (p=0,549).
Conclusion: There is a low correlation between laser polarimetry and Pulsar perimetry in patients with ocular hypertension. The fact that the magnocellular pathway (theoretically studied by Pulsar perimetry) is affected in early stages of glaucoma can explain such poor correlation between a structural damage studied by laser polarimetry and a functional lesion studied by Pulsar perimetry. There may be a temporal lapse between both defects which may explain our results.

P-8.- A.M. Fernández-Vidal1, J.García-Feijoó1, M.González-Hernández2, C.Méndez-Hernández1, R.Giménez1, J.Martínez de la Casa1, A.Castillo1, M.González de la Rosa1, J.García-Sánchez1
INITIAL FINDINGS WITH THE NEW PULSAR PERIMETRY IN PATIENTS WITH OCULAR HYPERTENSION
ARVO 2002
1Ophthalmology, Hospital Clínico San Carlos, UCM, Madrid, Spain; 2Ophthalmology, Hospital
Purpose: To evaluate our first results with Pulsar perimetry in patients with ocular hypertension and compare them with normal individuals.

Methods: Pulsar perimetry is a new perimetric procedure which uses stimuli combining spatial resolution (SR) and contrast (C) for early glaucoma evaluation. Pulsar perimeter shows white round stimuli, 5° in diameter, 500 msec log, shaped as a wave decreasing in amplitude, in 66 locations. The stimuli scale combines SR and C in 36src units. The prototype has the ability to examine various visual functions (spatial resolution, contrast perception, motion and temporal modulation), which theoretically excite large ganglion cells. The magnocellular system is thought to be affected prematurely in glaucoma. A temporal modulation program with pulsing stimuli at 30 Hz (phase-counter-phase oscillations) was used (program T30W). We studied 30 left eyes of 30 patients with ocular hypertension and normal G1 Octopus perimetry (mean age: 58.97 SD 11.25) and 30 left eyes of 30 normal individuals (mean age: 42.87 SD 16.11). A complete ophthalmologic examination, including temporal modulation Pulsar perimetry with TOP strategy, was performed for all patients. Exclusion criteria: visual acuity 3 spheric dp or 1.5 astigmatic dp, pupil size <3 mm, ocular surgery or pathologies, lens opacities, and non controlled diabetes or neurological diseases. They all had previous perimetric experience. Results were analyzed with t-test procedure.

Results: For normal individuals, mean sensitivity (MS) for Pulsar perimetry was 21.21 src (spatial resolution and contrast units) with an SD of 4.66. Mean defect (MD) was 0.65 src SD 1.39 and loss variance (LV) was 5.96 src DS 4.16. For patients with ocular hypertension: MS was 17.64 src SD 2.74; MD was 3.59 src SD 2.45 and LV was 10.09 src SD 6.84. MS, MD and LV differences between the two groups were statistically significant (p<0.01) with 99% confidence limits of (0.94;6.20), (-4.30;-1.56;) and (-8.03; -0.24) respectively. Area under ROC curve obtained was of 0.84.

Conclusion: Pulsar perimetry may have greater sensitivity for the detection of early defects in patients with ocular hypertension than conventional perimetry.

VISUAL ACUITY INFLUENCE ON PULSAR T30W PERIMETRY.
Presentado al Congreso de la Sociedad Española de Oftalmología, 2003

Introduction: Pulsar T30W perimetry examines the contrast curve in the peripheral visual field with a scale which combines visual acuity and contrast (src units) using a sinusoidal white stimulus, 5° in diameter which pulses in phase and counter-phase at 30Hz. The influence of visual acuity associated to refractive error on the results of this examination was assessed.

Material and Methods: 19 eyes of 19 normal subjects with ages between 25 and 45 years were examined in three occasions. A visual acuity scale was shown on the screen that is used to show the perimetric stimuli. After reaching the most positive refraction that allowed visual acuity 6/6, hypercorrection with positive lenses was carried out to reduce visual acuity and carry out T30W examinations.

Results: Visual acuity was reduced 0.16% for every diopter of hypercorrection (r = 0.87, p < 0.01 ). Every reduction of one tenth of visual acuity increments the mean defect (MD) 0.78src (r = 0.78, p < 0.01).

Conclusions: As in conventional luminous threshold perimeter and FDT perimetry (Artes PH et al, IOVS, 2003), the results of Pulsar T30W perimetry are influenced by the subject’s visual acuity. Proper optical refraction is needed to achieve correct results.
P11.- Manuel Gonzalez de la Rosa, Jose Ramon Perez Fernandez, Marta Gonzalez-Hernandez. Tinguaro Diaz Aleman, Raul de Armas Plasencia.
TOP-WW, PULSAR, FDT AND HRT-II DIAGNOSIS REPRODUCIBILITY IN GLAUCOMA SUSPECTS

Purpose: To determine the diagnostic capability of TOP-32-WW, PULSAR-T30W, FDT-Threshold-N30 and HRT-II in glaucoma suspects.

Methods: 47 eyes from 47 subjects referred as glaucoma suspects (GS) were examined twice. Cases with TOP-WW-MD>6dB were excluded. Results were compared with those obtained from 70 normal control subjects (C).

Results: The mean MD value using TOP-32-WW in the GS group (0.96dB. sd=1.77) was not significantly different than in C (0.8dB. sd=1.77) (p>0.05). Disc area in GS (2.12 mm². sd=0.34) was significantly higher than in C (1.97 mm². sd=0.45) (p<0.01). For 95% specificity, the diagnostic capabilities (sensitivity x reproducibility / 100) were TOP-WW-MD: 3.9%, LV squared root (TOP-WW-sLV)=19.4%, PULSAR-MD:13.0%, PULSAR-sLV=22.3%, FDT-MD=10.5%, FDT-PSD=8.6%. Some HRT II numerical indices had worst diagnostic capability when weighted in relation to the Disk area: Vertical cup/disk ratio (24.4 to 8.5%) or Maximum contour depression (29.9 to 14.1%) and others maintained it: The Maximum contour elevation (27.7 to 24.9%) and Reference height (24.1 to 25.7%). The association of perimetric and HRT II indices achieved high sensibility but low diagnostic reproducibility. The best diagnosis coincidence between perimetric indices and HRT II was also found with PULSAR-MD.

Conclusion: Many GS actually correspond to normal big optic nerves. The best perimetric diagnostic capability corresponded to PULSAR-sLV and TOP-WW-sLV. The most effective HRT II indices were: Maximum contour elevation, and Reference height.

P12.- C Méndez Hernández, J García Feijoo, A Fernández Vidal, M González de la Rosa, JMª Martínez de la Casa, J García Sánchez.
LASER POLARIMETRY AND WHITE-WHITE. PULSAR, FDT AND FLICKER PERIMETRIES IN OCULAR HYPERTENSION.

Hospital Clínico San Carlos, Madrid and Hospital Universitario de Canarias. SIC de Tenerife.

Purpose: To evaluate the diagnostic yield of White-White (TOP G1- WW), Pulsar, FDT and TOP-Flicker perimetries and of laser polarimetry in patients with ocular hypertension (OH).

Method: Each test was performed by five homogeneous groups for age and sex of OHT (selected based on a normal papilla and to the loss variance square root or sLV- TOP-WW <2.45) and normal (controls) patients for the analysis of the following parameters: the 36 parameters of the laser polarimetry (NFA II- GDx version 1.0.04) (GDx), mean defect (MD) for Octopus topG1 (tG1), MD and sLV for Pulsar and Ricker, and MD and pattern standard deviation (PSD) for FDT. Only one eye per patient was analysed. - Group 1 (tG1): 63 OHT patients and 62 controls. - Group 2 (Pulsar): 56 OHT patients and 47 controls. - Group 3 (FDn: 49 OHT patients and 44 controls. - Group 4 (Flicker): 53 OHT patients and 59 controls. - Group 5 (GDx): 58 OHT patients and 46 controls.

Results: Best ROC areas (p<0.05) corresponded to the quotients Ratio "Mean "Superior/Inferior (RMSI) (63.7) and Ratio Integral Superior/Inferior (RISI) (62.8) of GDx and Pulsar's MD (60.4). With a 950/0 of specificity, the parameters with best sensitivities corresponded to RMSI (22.4Dlo), RISI (190¡0) and Pulsar's MD (17.90f0).

Conclusions: Pulsar's MD, RMSI and RISI of GDx were the only ones that showed capacity to differ between controls and OHI Other indexes of GDx like RI17;" RMIN; EM and RMIT also presented significant differences, but contrarily to what expected they were more normal in OHT than in controls. None of the FD7," Flicker and Octopus indexes reached significant differences between OHT and controls. Demanding a high specificity (95%), the most sensitive parameters corresponded to those of the GDx which analyse the relationship between the superior and inferior quadrants of the nerve fibre layer; and to Pulsar's MD.

P13.- Marta González-Hernandez
PULSAR - Early detection using a temporall spatial modulated stimulus
University of Laguna, Spain
8th International Octopus Symposium. Thun, 2004

The PULSAR perimeter simultaneously examines temporal visual functions associated to spatial resolution and contrast. In previous studies we observed that 30% of subjects with ocular hypertension and 100% of subjects with glaucoma show defects in this kind of perimetry. At the Instituto Castroviejo in Madrid, they have confirmed that PULSAR detects defects in patients with ocular hypertension earlier than with FDT or GDx. Our group has carried out two papers on glaucoma suspects. In the first one, 66 normal control
subjects and 109 glaucoma suspects were examined with TOP WW, PULSAR and FDT perimeties and with HRT II. The most sensitive perimetric indices were sLV V-PULSAR and sLV TOP-WW an9 the less sensitives MD-WW and FDT. Some HRT II indices, such as the Vertical cup/disk ratio, showed false sensitivity, since the disk area of glaucoma subjects was bigger that that of controls. In a new study we examined 47 glaucoma eyes and 70 normal subjects twice. The maximum ROC area was achieved with sLV-PULSAR. MD-WW and FDT Indices showed significantly low diagnosis capability. When correcting the HRT II indices in relation to the Disk area, some indices such as the Maximum contour elevation and the Reference height, maintained their sensitivity while others, such as the Maximum contour depression-or the Vertical cup/disk ratio, were considerably reduced. If we define diagnosis capability as the product between sensitivity and reproducibility, the best indices were the Referenced height, Maximum contour elevation, sLV and sLV TOP-WW. MD-PULSAR showed significative correlation with 9 HRT II indices and sLV-PULSAR with none. As a conclusion we may say that some of the disk indices have much lower diagnosis capability than presumed because they highly depend on the disk size. Reference height and Maximum contour elevation are sensitive and reproducible when the Disk area influence is corrected. The best perimetry indices were sLV-PULSAR and sLV TOP-WW, which are very sensitive, although slightly less reproducible. This probably represents a pre-anatomical defect, due to its low correlation with the HRT II and GDx indices.

P14.- Manuel González de la Rosa, Carmen Méndez Hernández, José Ramón Pérez Hernández, Julián García Feijoo, Marta González-Hernández, Tinguaro Díaz Alemán, Julián Garcia Sánchez. Instituto Castroviejo. TOP STRATEGY AND PULSAR T30W PERIMETRY IN GLAUCOMA EARLY DIAGNOSIS.
In "Progress in Glaucoma Research." Nova Science Publishers, Inc. 400 Oser Avenue, Suite 1600. Hauppauge, NY 11788
In press.
COLOR

PERFORMANCE EVALUATION OF OCTOPUS STANDARD AND TOPS ALGORITHMS IN WHITE-ON-WHITE & BLUE-YELLOW PERIMETRY
School Of Optometry, University of Waterloo, Waterloo, Canada.
Purpose: To evaluate the comparative performance of the TOPS algorithm to the standard (Std) algorithm of the Octopus perimeter in white-on-white (W-W) and blue-on-yellow (B-Y) automated perimetry.
Methods: Fifteen experienced normal subjects (mean age=31.2 years; SD=4.1 years) underwent two perimetric algorithms (Std & TOPS) with two different stimulus parameters (W-W & B-Y) at two visits. At each visit, each examination was separated by a minimum of ten minutes and subjects were allowed to rest as often as needed throughout the procedures. Exclusion criteria were as follows: refractive error >±5.00DS and/or >±2.50DC; visual acuity worse than 6/9; history of eye disease, ocular findings or systemic medication known to affect the visual field. The examination duration and the visual field indices of mean sensitivity (MS) and loss variance (LV) were compared between algorithms and between stimulus parameters.
Results: The mean duration of the TOPS algorithm (mean=2.07 mins; SD=0.21) was shorter than that of the Std algorithm (mean=10.42 mins; SD=1.38; p<0.0001), regardless of stimulus parameters (p=0.003). The mean sensitivity of TOPS (mean MS=26.71dB; SD=1.43) was slightly higher than the Std algorithm (mean MS=26.21dB; SD=1.38) as expected from the reduced examination duration, but this difference did not reach statistical significance for either stimulus parameter (p=0.174). The root mean square error of the test-retest threshold values was larger for the Std B-Y procedure than for TOPS B-Y (p=0.002), but this difference was not observed between the algorithms for the W-W stimulus parameters (p=0.55). The B-Y procedure identified larger LV than the W-W procedure (mean LV B-Y= 4.35dB, SD=2.16; mean LV W-W=3.93dB; SD=1.96; p=0.003) but the magnitude was not significantly different between the TOPS and the Std algorithm (p=0.60).
Conclusions: The TOPS algorithm in W-W and B-Y perimetry has significantly shorter examination duration. In young normal subjects, this time saving is not achieved at a loss of accuracy or repeatability. However, further study is required to determine if TOPS maintains a similar performance in study populations with abnormal visual fields.

C-2.- Ayala-Barroso E, Sanchez Mendez M, Gonzalez Hernandez M, Gonzalez De La Rosa MA.
White-on-white, blue-on-yellow and blue-on-blue perimetry in normal subjects.
Hospital Universitario de Canarias, Universidad de La Laguna, Islas Canarias, España.
PURPOSE: To compare blue-on-blue differential contrast perimetry (BB), in accordance with E. Land <<Retinex>> theory, with white-on-white (WW) and blue-on-yellow (BY) perimetries on normal subjects.
METHODS: An Octopus 101 perimeter was modified for BB perimetry, using a 4cd/m(2) background and stimulus Goldmann size V. Fifty healthy subjects (10 per decade, from 20 to 70 years) were examined twice with each type of perimetry (WW, BB, BY) using the TOP strategy.
RESULTS: The results obtained with WW, BY and BB perimetry were respectively: Reduction of sensitivity per year: 0.13, 0.27 and 0.13 dB; correlation coefficient (r) of threshold with age (and error of estimation of Y over X): -0.63 (2.24 dB), -0.70 (3.77 dB) and -0.80 (1.32 dB); threshold fluctuation: 2.21, 3.03 and 2.03 dB; percentage of points deviated more than 5dB from the expected value for the patient age: 8.1, 16.0 and 4.2%.
CONCLUSIONS: Perimetric results are more stable with BB strategy than with the other two types of perimetry. BY perimetry gives the worst results: threshold reduction with age is twice higher, individual fluctuation is 50% higher and points away from the mean value are much more frequent. Overlapping between blue and yellow filters is minimal in Octopus. Therefore, an absolute threshold is examined, which is much more unstable than WW or BB differential thresholds,producing more noise than WW, but in a lesser proportion.

C-3.- González de la Rosa M, Ayala E, Sánchez M, González-Hernández M.
COMPARING W/W, B/Y AND B/B PERIMETRY USING OCTOPUS 101.
Hospital Universitario de Canarias. Spain.
Purpose: The “Retinex theory” for color vision by E. Land describes three different color pathways for low, medium and high wavelengths each. This way chromatic perception is explained as being independent from the type illumination. The purpose of this paper is to compare blue contrast perimetry (BB), which has
previously been described(*), with white-white perimetry (WW) and blue-yellow perimetry (BY or SWAP) in normal subjects, ocular hypertension and early glaucoma.

**Methods:** An Octopus 101 perimeter was modified to do BB perimetry, using a 4 cd/m² background and a Goldman V stimulus. 50 healthy subjects (10 per decade, aged from 20 to 70 years, one eye per patient) were examined twice with the three types of perimetry, using the TOP strategy. A group of patients with ocular hypertension and early glaucoma (MD<7dB) were examined using the three methods.

**Results:** The results for WW in normal subjects, BY and BB were respectively: Loss per year 0.13, 0.27 and 0.13 dB; threshold correlation coefficient (r) with age (and error of estimation of Y over X) -0.63 (2.24 dB), -0.70 (3.77 dB) and –0.80 (1.32 dB). The values for threshold fluctuation between the first and second examination were 2.21, 3.03 and 2.03 dB. Percentage of points with a deviation 5dB higher than the predicted value from the regression equation for the different ages were 8.1, 16.0 and 4.2%. The BB results in ocular hypertensive and early glaucoma patients were similar to WW although the better delimitation of results in normality allowed the better definition of some defects. BY gave a wider dispersion of the results. That is more defects and more hypernormal points at the same time.

**Conclusions:** BB perimetry provides more stable results than the other two types. This is possibly due to the use of a Goldmann size V, but it does not detect more defects. BY perimetry gives the worst results. The threshold reduction with age is twice higher, individual fluctuation 50% higher and points with thresholds deviated more than 5 dB are much more frequent. BY produces wider dispersion of the results in patients with early defects. We think that the higher defect frequency of this technique is due to an increase of "noise" more than to a better "signal".

LTP in Pulsar Perimeter

LTP-1.- Marta Gonzalez-Hernandez, Manuel Gonzalez de la Rosa, Alicia Pareja Ríos, Virginia Lozano Lopez, Fátima Mesa Lugo.

TOPOGRAPHICAL SPATIAL SUMMATION IN THE CENTRAL VISUAL FIELD.

Purpose: Luminance (L) and area (A) of the stimulus are related by the equation $L \times A^k = \text{constant}$. We evaluated the k value in 66 positions of the central visual field.

Methods: 10 eyes of 10 healthy subjects were examined for conventional luminous thresholds in 66 locations of the central visual field with the TOP strategy using sizes Goldmann 4, 3.5, 3, 2.5, 1.9 and a 31.5 asb background in the PULSAR perimeter.

Results: In relation to the threshold value obtained for size 4, sensitivity decreased 1.5, 2.9, 5.4 and 7.8 dB for the following sizes (average $k=0.616$). The k value increased in a lineal manner from the centre towards the periphery, with a slope of 0.01 per degree for mean values at 10 analyzed eccentricities ($r=0.98, p<0.01$) but with unequal slopes at the different meridians. In the inferior hemi-fields it was higher ($k=0.657$) than in the superior hemi-fields ($k=0.574$). k value at the supero nasal hemifields is quite similar to that found at the paracentral region, and are maximum in the temporal inferior region.

Conclusion: Spatial summation in the central visual field has specific values for every position, which could be explained not only by the topographical differences of the ganglion cell but also, possibly, by the density of other cellular types and specificities in its physiological characteristics of its receptive fields.