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Comparison of *SITAfas*t to Standard Full Threshold in Automated Perimetry

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Abstract:
A comparative study of visual field evaluation by SITAfast strategy and standard full threshold algorithm on 30 randomly chosen patients with POAG. The glaucoma patients were divided into three groups based on the severity of the disease. Each patient underwent visual field testing by SFT and SITAfast strategies on the same day with an interval of 1-2 hours. Results: SITAfast was found to have 89.47% sensitivity as well as positive predictive value, 81.82% specificity and negative predictive value. SITAfast has an accuracy of 86.67%. The values of Pattern Standard Deviation, Mean Deviation and points with less than 0.5% probability which are all indicative of severity of disease were found to be comparable in SITAfast and SFT. The mean percentage of time saved was 61%. Conclusion: These results suggest that SITAfast matches the precision of older thresholding methods consuming considerably and significantly less test time. SITAfast can be used as a standard clinical test in glaucoma evaluation without decreasing the quality of test results.

Keywords*: SITAfast ,POAG, standard full threshold algorithm*

1. Introduction

Visual field testing has evolved remarkably from the era of the tangent screen to the present age of computerized perimetry over the last 100 years. By reducing the influence of the perimetrist, automated perimetry improves the uniformity and reproducibility of visual fields. Standard threshold perimetry is an important test used to diagnose and monitor open angle glaucoma. Unfortunately, the test can be tedious and demands that a patient concentrate for upto 15 minutes or more per eye to achieve results. It is known that the perimetric sensitivity decreases with increasing test duration in normal subjects and glaucoma patients.

SITA stands for Swedish Interactive Thresholding Algorithm. The pioneers of the strategy were the Department of Ophthalmology, Malmo General Hospital, Sweden led by Boel Bengston, the Department of Mathematical Statistics, University of Lund, Sweden led by Johny Olson, Humphrey system-California. The purpose of the work done in Malmo General Hospital was to develop a test algorithm which significantly reduced test time without any reduction of data quality. A comprehensive visual field model constructed from available knowledge of normal or glaucomatous visual fields is continuously updated during testing. The model produced threshold estimates and also estimates of the certainty to which the threshold is known at each point.

2. Material and Methods

A total of 30 patients with primary open angle glaucoma were enrolled into the study. Patients were randomly selected from those who attended the glaucoma clinic for evaluation as well as follow up. Inclusion criteria were a diagnosis of POAG based on IOP more than 21mm Hg, gonioscopically open angles and a combination of optic disc changes like cupping, notching, thinning or pallor of the neuro-retinal rim and visual field defects. Exclusion criteria were gonioscopically closed angles, medial opacity, pupil size less than 3mm.

Each patient was subjected to visual field evaluation. The test was explained to the patient thoroughly. Automated static suprathreshold perimetry was done in a Humphrey visual field analyzer, Model 740. Initially central 30-2 threshold testing was done. After 1-2 hours central field was evaluated with SITAfast strategy. Same parameters were used. The data collected was entered into a master sheet and statistical tables were constructed. For comparing SFT with SITAfast, the statistical constants like mean, standard deviation and range were computed. The diagnostic effectiveness of SITAfast with SFT was assessed by computing sensitivity, specificity, accuracy, positive predictive and negative predictive values.

3. Results

By considering SFT as the golden standard, the diagnostic effectiveness of SITAfast was assessed by computing sensitivity and specificity. Borderline and outside normal limits Glaucoma hemi-field test were taken as positive for disease and GHT within normal limits was taken as absence of visual field defect.

SITAFAST	SFT		Total
	Positive/Borderline	Negative	
Positive/Borderline	17	2	19
Negative	2	9	11
Total	19	11	30

Table 1: Comparison of diagnostic effectiveness

The Patients were classified into three groups of increasing severity of the disease as assessed by the CPSD. Group I had CPSD ≤ 5, Group II had CPSD 5 – 10, Group III, CPSD ≥ 10. An attempt was made to see the difference in the mean deviation, if any, between SFT and SITAfast.

Group	SFT (M.D) $\bar{x} \pm$ S.D	SITAfast (M.D) $\bar{x} \pm$ S.D	t value	P value
I	-4.33 ± 2.98	-4.59 ± 3.12	0.28	P >.05
II	-17.79 ± 7.62	-17.11 ± 7.48	0.14	P >.05
III	-18.52 ± 3.31	-17.05 ± 7.76	0.30	P >.05
Total	-7.99 ± 7.30	-7.92 ± 7	0.038	P >.05

Table 2: Mean ± SD of mean deviation (dB) in SFT/SITAfast and level of significance

In Group I, Mean Deviation was -4.53, in place of -4.59 in SITAfast. Group II, Mean Deviation was -17.79 and -17.11. Group III also showed only a marginal difference in M.D. The statistical test revealed that none of these differences were significant statistically (P>0.05)

Group	SFT (M.D) $\bar{x} \pm$ S.D	SITAfast (M.D) $\bar{x} \pm$ S.D	t value	P value
I	1.53 ± 2.6	2.55 ± 4.15	0.98	P >.05
II	28.1 ± 11.03	32.43 ± 12.89	0.57	P >.05
III	41.89 ± 10.73	31 ± 11.5	1.10	P >.05
Total	9.99 ± 15.68	10.39 ± 14.89	0.04	P >.05

Table 3: Mean ± SD of percentage of points < 0.5 probability in SFT/SITAfast

SITAfast has an increased percentage of points with < 0.5% probability compared to SFT in Groups I and II. At the same time it showed a reverse trend in Group III. While considering all three groups together, the mean in SFT was 9.99 compared to 10.39 in SITAfast. None of the groups as a whole showed any significant difference. In other words, the difference noted was only due to sampling variation.

Group	SFT (M.D) Mean ± S.D of time	SITAfast (M.D) Mean ± S.D of time	t value	P value
I	14.06 ± 2.97	4.73 ± 0.98	13.93	P<.001
II	15.47 ± 4.79	6.808 ± 0.63	4.01	P<.01
III	15.14 ± 2.75	7.29 ± 0.11	4.56	P<.01
Total	14.4 ± 3.23	5.33 ± 1.33	4.51	P<.01

Table 4

From the table, it can be noted that SFT took three fold increased time compared to SITAfast in Group I. Groups II and III took more than twice the time in SFT compared to SITAfast.

4. Discussion

The study has compared SITAfast to Standard Full Threshold testing in glaucoma patients. The sensitivity and specificity of SITAfast were found to be 89.47% and 81.82% respectively. The mean percentage of time saved in SITAfast was found to be 61%. The percentage of time saved was calculated separately in three different patient groups divided according to the severity of disease and ranged from 55-66%. The values of mean deviation and points with < 0.5% probability, which are indicators of severity of disease, were found to be comparable in SITAfast and Standard Full Threshold.

These results suggest that SITAfast matches the precision of older thresholding methods, consuming considerably and significantly less test time. This indicates that SITAfast can be used as a standard clinical test for glaucoma evaluation without decreasing the quality of test results.

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