• Clinical Research •

Comparison of the SITA Faster–a new visual field strategy with SITA Fast strategy

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Abstract

● **AIM:** To compare visual field defects using the Swedish Interactive Thresholding Algorithm (SITA) Fast strategy with SITA Faster strategy, a newly developed time-saving threshold visual field strategy.

● **METHODS:** Ninety-three participants (60 glaucoma patients and 33 normal controls) were enrolled. One eye from each participant was selected randomly for the study. SITA Fast and SITA Faster were performed using the 24-2 default mode for each test. The differences of visual field defects between the two strategies were compared using the test duration, false-positive response errors, mean deviation (MD), visual field index (VFI) and the numbers of depressed test points at the significant levels of $P<5\%$, $<2\%$, $<1\%$, and $<0.5\%$ in probability plots. The correlation between strategies was analyzed. The agreement between strategies was acquired by Bland-Altman analysis.

● **RESULTS:** Mean test durations were 246.0±60.9s for SITA Fast, and 156.3±46.3s for SITA Faster ($P<0.001$). The test duration of SITA Faster was 36.5% shorter than SITA Fast. The MD, VFI and numbers of depressed points at $P<5\%$, $<2\%$, $<1\%$, and $<0.5\%$ in probability plots showed no statistically significant difference between two strategies ($P>0.05$). Correlation analysis showed a high correlation for MD ($r=0.986$, $P<0.001$) and VFI ($r=0.986$, $P<0.001$) between the two strategies. Bland-Altman analysis showed great agreement between the two strategies.

● **CONCLUSION:** SITA Faster, which saves considerable test time, has a great test quality comparing to SITA Fast, but may be not directly interchangeable.

● **KEYWORDS:** visual field; SITA Faster strategy; SITA Fast strategy; glaucoma

INTRODUCTION

Glaucoma is the leading cause of irreversible blindness worldwide[1-3]. Visual field (VF) evaluation, optic nerve head and retinal nerve fiber layer imaging are critical indicators used in the diagnosis and management of glaucoma[4]. Perimetry is the most commonly used method for detecting patient's VF or visual function. The first automated perimeter was invented in 1969, after then, it had developed into more comprehensive VF inspection methods. Full threshold automated VF examination had been the gold standard for the diagnosis and follow-up of glaucoma for several decades[5-7]. It provided an accurate assessment, but was time consuming[8-9]. At that time, test duration usually exceeded 15min per eye[10-12]. Prolonged test time may result in a great potential for visual fatigue, which may tend to decrease threshold values and may cause less reliable results[8,13-15]. This had even more obvious effect on glaucoma patients[11,15]. Besides fatigue, the long test duration also limited the possibility that VF tests could be performed more frequently. Although shorter tests were available, their reliability was reduced, which was a trade-off between accuracy and efficiency[16]. Many new strategies have been developed for the purpose of reducing test duration and maintaining accuracy[17-19]. For example, the Swedish Interactive Thresholding Algorithm (SITA) strategies were developed in the late 1980s and become a very important tool to detect VF. SITA strategies, including SITA Standard (SS) and SITA Fast (SF), had been reported to be both

fast and reliable[10-11]. The test duration of SF strategy was reduced by 70% when compared to the test duration of full threshold algorithms[10-11,20-21]. SF also had been proven to be highly sensitive, specific and reliable[18,22-23], which was used commonly by a majority of eye care professionals in many countries[24]. Therefore, using simple and rapid VF tests as a screening method become possible[25]. However, to monitor glaucoma efficiently, more frequent VF tests were needed to better observe the progression and to set up the treatment plans[26-27]. Recently, at least 3 tests per year for the first 2y after the diagnosis was required[27-28], and this was much more than the number of routine examinations in current clinical practice[29-30]. Thus, clinical practice strongly required a faster and accurate VF strategy. Therefore, researchers dedicated to find a more convenient device which had shorter test time and without losing of test quality. Recently, SITA Faster (SFer) was produced, which was developed for the purpose to replace SF[24]. Seven modifications were made to SF to produce SFer: 1) age-corrected initial stimulus intensities; 2) reducing reversals at primary test points; 3) using SF's Prior model; 4) only one test at perimetrically blind points; 5) no false negative (FN) catch trails; 6) using gaze tracker; 7) eliminating the extra delay times[24]. Compared with SF, what were the advantages of SFer, and whether the results of the two strategies were interchangeable? However, as a newly developed VF test strategy, there were really few studies about the property of this strategy.

The purpose of this study was to evaluate this new time-saving threshold VF strategy, SFer, to compare its performance to SF strategy in four different groups, including the test duration and the agreement or differentiation between the two strategies.

SUBJECTS AND METHODS

Ethical Approval A retrospective observation study was conducted. The study proposal was approved by the Kunming Medical University Ethics Review Board. The research was conducted according to the tenets of the Declaration of Helsinki. Written informed consent was obtained from all participants.

Subjects Ninety-three participants (60 glaucoma patients and 33 normal volunteers) were enrolled in this study at the First Affiliated Hospital of Kunming Medical University. Normal was defined as having no ocular diseases, no other related field dysfunction. Diagnosis of glaucoma was based on the current glaucoma guidelines[4,27]. All subjects had refractive errors within ±8 D spherical equivalent and cylinder ≤3 D. Best-corrected visual acuity ≥20/40. Patients with any other ocular diseases affecting the VF besides glaucoma were excluded from the study.

Methods SF and SFer were all performed on the Humphrey 850 perimeter (Carl Zeiss Meditec, Inc, Dublin, CA, USA) in

the 24-2 default mode. Both eyes were tested in random order, and one eye from each participant was chosen randomly for the study. All participants had previous experience with perimetry. SF tests were considered unreliable if the fixation losses, false positive (FP) and FN responses >25%. As there were only two reliability indices for the SFer, the FP catch trials and the gaze tracker, so we defined it was reliable for an SFer result if the FP rate ≤25% and >6° of eye movement ≤20% of the time[31]. Patients had a short break of at least 15min between the two tests. In order to further analyze the differences among differing stages of glaucoma, and show some differences from the study of Heijl et al[24], patients were classified into 3 groups based on mean deviation (MD) from SF, as per the methods of Gazzard et al[32]. Mild glaucoma, defined as MD≥-10 dB (n=29); moderate glaucoma, MD less than -10 dB but more than or equal to -20 dB (n=17); and severe glaucoma, MD≤-20 dB (n=14).

Statistical Analysis Statistical analyses were done using SPSS 22.0 (Armonk, NY, USA) and MedCalc 18 (Acacialaan, Ostend, Belgium). The differences of test times, MD, the numbers of depressed test points at the significant levels of $P<5\%$, $<2\%$, $<1\%$, and $<0.5\%$ in the total deviation (TD) and the pattern deviation (PD) probability plots between the two strategies were compared with analysis of variance (ANOVA) and Student's t-test. The agreement of the MD and VFI between the two strategies was analyzed through Bland-Altman plots. The correlation between the two strategies for MD and visual field index (VFI) was analyzed using nonparametric Spearman correlation method. The differences of FP values between the two strategies were analyzed through nonparametric Wilcoxon signed rank test. The statistically significant level was set at the $P<0.05$.

RESULTS

Of the 93 participants, 34 were men (37%) and 59 were women. The mean age of the subjects was 48.6±20.0y (range, 13-84y). VF were successfully measured using the SF and SFer strategies.

The number of participants who had PF response for SF and SFer was 37/93 and 35/93. The median value was 3% for SF and 4% for SFer. There was no significant difference in PF between the two strategies for all the participants ($P=0.618$) and for each subgroup (mild group: $P=0.425$; moderate group: $P=0.058$; severe group: $P=0.064$; normal group: $P=0.174$).

A summary of the overall test times of each group were provided in Table 1. The mean durations of glaucoma patients for SF were 264.9±64.5s, for SFer were 177.4±44.2s, about 33% shorter. When the pairwise comparisons were performed for the 4 groups, the test durations of the two strategies were statistically different ($P<0.001$). Scatter plot of test durations for both strategies were showed in Figure 1, showing that SFer

Table 1 Test durations of different groups for SITA Faster and SITA Fast mean±SD

Groups	n	Mean durations (s)		Time improvement	SF-SFer (s)	P
		SFer	SF			
Normal	33	117.9±14.0	211.8±33.2	44.3%	93.9±36.2	<0.001
Mild	29	143.1±25.9	212.1±36.4	32.5%	69.0±35.1	<0.001
Moderate	17	206.7±33.1	301.0±40.4	31.3%	94.3±59.0	<0.001
Severe	14	212.9±27.8	330.4±33.9	35.6%	117.5±39.6	<0.001
Total	93	156.3±46.3	246.0±60.9	36.5%	89.8±43.8	<0.001

SF: SITA Fast; SFer: SITA Faster.

Table 2 MD of different groups for SITA Faster and SITA Fast mean±SD

Groups	n	Mean MD (dB)		SFer-SF (dB)	P
		SFer	SF		
Normal	33	-1.81±1.30	-2.06±1.16	0.28±1.15	0.173
Mild	29	-4.32±2.27	-4.37±2.31	0.05±1.62	0.870
Moderate	17	-14.78±3.53	-15.33±2.61	0.55±2.55	0.386
Severe	14	-27.13±3.94	-27.52±3.66	0.39±1.00	0.169
Total	93	-8.77±9.39	-9.05±9.42	0.27±1.60	0.103

MD: Mean deviation; SF: SITA Fast; SFer: SITA Faster.

had significant shorter test durations than SF. Test durations were obviously dependent on the severity of the VF defects. The shortest test durations were found in normal group. However, the biggest duration improvement between the two strategies was in the severe glaucoma group, followed by in mild glaucoma group and moderate glaucoma group.

MD values were similar in each group between the two strategies. The median MD values were -4.55 dB for SFer, -4.47 dB for SF. Differences between the strategies and subgroups were showed in Table 2. The MD values of SFer were slightly bigger than those of SF in each group, however, there were no statistically significant differences between the two strategies.

The numbers of depressed points at the significant levels of $P<5\%$, $<2\%$, $<1\%$, and $<0.5\%$ in TD and PD probability plots for each group were listed in Table 3. There was no statistically significant difference between the numbers of depressed points at any of the probability plots.

In Figure 2, Bland-Altman plots of MD and VFI illustrated the agreement between strategies. For MD, there was a mean difference of -0.3 dB (MDSFer–MDSF). For VFI, there was a mean difference of 0.0 (VFISFer–VFISF). The analysis suggested good agreement between the two strategies.

Correlation between SFer and SF was showed in Figure 3. There was a high correlation for MD ($r=0.986$, $P<0.001$) and VFI ($r=0.986$, $P<0.001$) between the two strategies.

DISCUSSION

The present study aimed at the performance of two VF strategies, SF and SFer. As a new strategy, the foremost advantage of SFer is obviously the shorter test duration. According to our study, the mean test durations for SFer strategy was 156.3±46.3s, which was 36.5% shorter compared
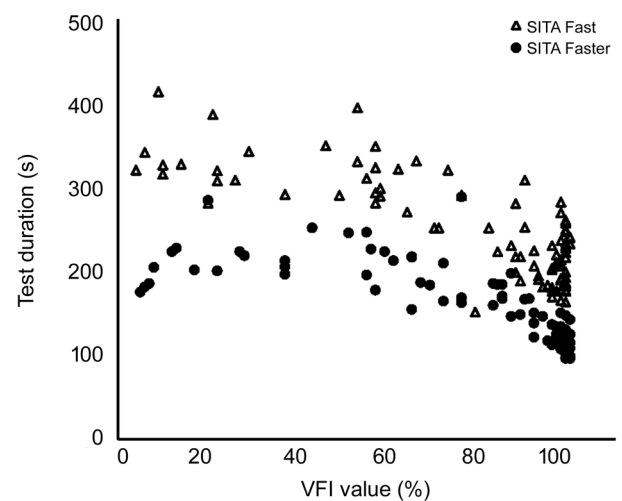

Figure 1 Scatter plot of test durations in different stages of glaucoma SITA Faster had significant shorter test durations than SITA Fast. The shortest test durations were in normal group. The biggest time improvement between the two strategies was in the severe glaucoma group. SITA Fast: $R^2=0.632$, 95%CL, 248.23, 281.54; SITA Faster: $R^2=0.588$, 95%CL, 166.01, 188.82. VFI: Visual field index.

to 246.0±60.9s for the SF strategy (Table 1). The results were similar to the previous study which had reported the test duration was 30.4% shorter when compared SFer to SF[24]. In the present study, each group had a significant improvement using SFer strategy. The biggest duration improvement between the two strategies was in the severe glaucoma group, suggesting that patients with severe glaucoma might be the best subjects to use SFer strategy for time saving benefits in clinical practice. Test durations were obviously related to the stage of glaucoma for both strategies (Figure 1). Test durations in eyes with severe glaucoma were about twice to those in the normal
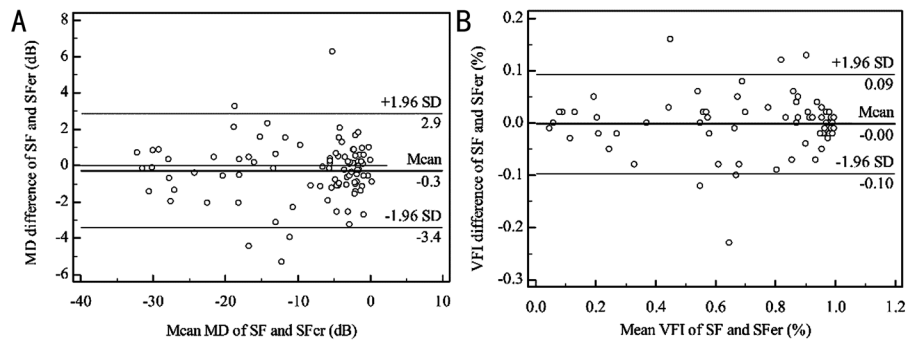
Figure 2 Bland-Altman plots of MD and VFI between SITA Faster and SITA Fast Bland-Altman scatter plot showed a great agreement between SITA Faster and SITA Fast. A: Bland-Altman plot of the difference in MD values. B: Bland-Altman plot of the difference in VFI values. The solid lines marked the mean differences, and the dash lines showed the 95% confidence intervals. MD: Mean deviation; VFI: Visual field index; SF: SITA Fast; SFer: SITA Faster.
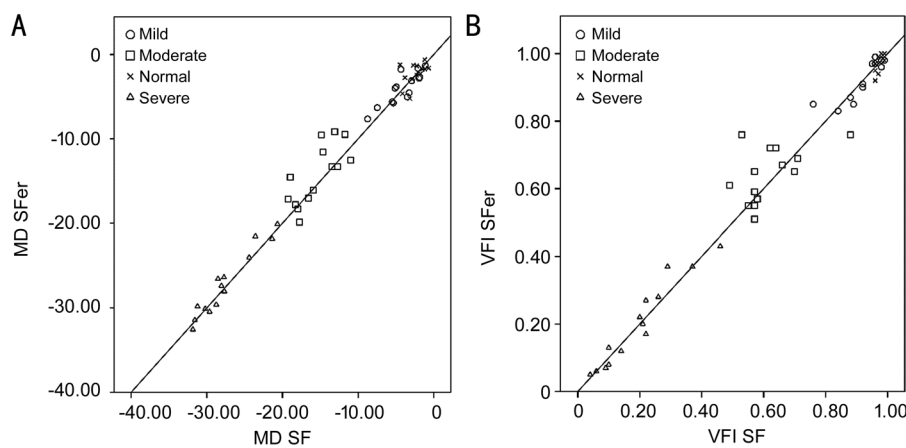

Figure 3 Correlations of MD and VFI between SITA Faster and SITA Fast Significant positive correlations were noted between the two strategies. A: Significant positive correlations in MD values between the two strategies (r=0.986, P<0.001). B: Significant positive correlations in VFI values between the two strategies (r=0.986, P<0.001). MD: Mean deviation; VFI: Visual field index; SF: SITA Fast; SFer: SITA Faster.

eyes and about half more than those in the mild stage eyes. Test durations were obviously dependent on the severity of the VF defects. The shortest test duration was found in normal group. Obviously, shorter test duration could increase testing efficiency and reduce visual fatigue. Statistically significant perimetric fatigue affected manifest in VF examinations[33-34]. In addition, based on feedbacks from participants after the test, the shorter test duration makes the task of completing a VF test a better experience. Compared with SF, SFer was more convenience and more acceptable.

In our study, we analyzed the number of PF responses for both strategies and for subgroups. The difference between the two strategies was not statistically significant for normal group (P=0.174) and for glaucoma groups (P=0.667). From this point of view, it seems a similar reliability between the two strategies. However, the percentage of FP for SFer (0-21%) were a little higher than SF (0-13%). This may be caused by that the initial stimulating intensity were age-corrected, similar to the difference between SF and SS, resulting in more uncertainty[35-36].

The MD represented sensitivity of global VF reduction. The difference of mean MD in total subjects was 0.27±1.6 dB (Table 2). SFer showed very similar mean MD values in each group when compared with those of SF. The MD comparison results indicated that there was no statistically significant difference between the two strategies (P>0.1), which was similar to study of Heijl et al[24]. The average values of "SFer-SF" in each group were insignificant and within the 1.0 dB equivalence limit range. The absolute MD values of SFer were slightly smaller than SF, suggesting a shallower field defect. Probably these modifications could explain the small differences of MD between the two strategies. Heijl et al[37] concluded in another study that these differences may be due to reduced visual fatigue and greater patient alertness. It had also been reported that differences in average threshold value were strongly associated with differences in test time[18]. Though this was statistically insignificant (P>0.1), but clinicians should still notice that results between the two strategies might be not directly interchangeable, for the results of SFer maybe underestimate the severity of glaucoma.

Table 3 The numbers of depressed test points at the significant levels of P<5%, <2%, <1%, and <0.5% in pattern deviation probability plots for SITA Faster and SITA Fast   mean±SD

Parameters	n	Numbers of depressed points		SFer-SF	95%CI	P
		SFer	SF			
Normal glaucoma						
Points<5%	33	3.2±2.3	3.1±1.7	0.1±3.0	-0.93, 1.17	0.816
Points<2%	33	0.9±1.1	1.3±1.3	-0.4±1.3	-0.85, 0.66	0.091
Points<1%	33	0.9±1.1	1.0±1.5	-0.1±1.6	-0.67, 0.43	0.658
Points<0.5%	33	0.3±0.6	0.3±0.7	0.0±0.6	-0.24, 0.18	0.768
Mild glaucoma						
Points<5%	29	4.3±2.2	4.6±2.3	-0.3±3.1	-1.47, 0.91	0.638
Points<2%	29	2.7±2.0	2.9±2.8	-0.1±3.1	-1.31, 1.03	0.811
Points<1%	29	2.5±2.0	2.3±1.9	0.1±2.3	-0.71, 0.99	0.742
Points<0.5%	29	4.6±5.1	4.6±5.5	0.0±3.2	-1.22, 1.22	1.000
Moderate glaucoma						
Points<5%	17	2.5±2.3	2.9±1.7	-0.4±3.0	-1.97, 1.22	0.623
Points<2%	17	2.5±1.5	1.9±1.4	0.6±2.0	-0.42, 1.67	0.222
Points<1%	17	3.1±3.3	3.0±2.2	0.06±4.3	-2.23, 2.35	0.954
Points<0.5%	17	21.7±7.4	23.8±7.2	-2.1±6.6	-5.66, 1.41	0.220
Severe glaucoma						
Points<5%	14	0.9±2.0	0.6±1.3	0.3±1.2	-0.45, 1.02	0.414
Points<2%	14	0.5±0.9	0.4±0.2	0.1±0.8	-0.41, 0.55	0.752
Points<1%	14	2.1±2.9	1.9±3.3	0.3±1.3	-0.45, 1.02	0.414
Points<0.5%	14	47.2±5.9	48.4±4.9	-1.1±2.1	-2.36, 0.07	0.063

CI: Confidence interval; SF: SITA Fast; SFer: SITA Faster.

As MD and VFI were global parameters for reduction in VF. The increased of MD and VFI values demonstrated a non-specific loss of sensitivity. By applying Bland-Altman test, we found a good agreement between the SF and the SFer (Figure 2). We analyzed the MD and VFI of the two strategies and found that the inter-strategies tests were comparable. The differences in the average of parameters between the measurements were statistically insignificant. The results were similar to study of Heijl et al[24].

The correlation relationships for MD and VFI between the two strategies were analyzed (Figure 3). There was a highly significant correction between the two strategies for either MD or VFI. While compared the different stages of glaucoma, only the moderate glaucoma group had a slight difference, with no statistical significance. Therefore, in our study, for assessing global VF sensitivity loss, SFer had a great test quality compared with SF.

Additional evidence for agreement between SF and SFer showed the similarity of numbers of depressed points in the TD and PD probability plots. As shown in Table 3, the numbers of depressed test points at the significant levels of P<5%, <2%, <1%, and <0.5% in each group had no statistically significant differences (P>0.05). These indices were focal parameters for reduction in VF. The highly agreement results demonstrated

that both strategies may be similar for determination of focal VF sensitivity loss.

There were some limitations which merit mentioning here. In this study, we compared SFer with SF strategy, not with SS. Now, SS has remained the most commonly used strategy and the glaucoma specialist community cares more about the comparison between SFer and SS. Any new technology should be compared to the standard. Practice needs to be supported by evidence and that is the question to be addressed and where data is needed. In our further study, the comparison between SFer, SF, and SS will be performed.

In conclusion, probably SF strategy was not an ideal gold standard to compare to, but its properties had been thoroughly investigated and SFer was design from SF. So according to our study, SFer showed very similar results in the number of FP responses, MD, VFI, and numbers of depressed points at any significant levels both in normal and glaucoma subjects when compared to SF. There was a great agreement between the VF data from SF and SFer. The test duration of SFer was 36.5% shorter than SF. Shorter testing times made the progress of VF test more convenient and could increase the frequency of test, which provided great assistance for detecting earlier of glaucoma and for assessing the rate of progression. As the screening methods should be rapid, inexpensive, convenient,

and highly sensitive[38], this new time-saving strategy may provide an ideal method for VF testing in patients with glaucoma, in subjects requiring screening, and may provide the optimal choice for disease follow-up. However, we should note that the visual field deficits of SFer were slightly smaller than those of SF. Therefore, the two strategies might be not directly interchangeable.

REFERENCES

1 Weinreb RN, Leung CK, Crowston JG, Medeiros FA, Friedman DS, Wiggs JL, Martin KR. Primary open-angle glaucoma. *Nat Rev Dis Primers* 2016;2:16067.

2 Jonas JB, Aung T, Bourne RR, Bron AM, Ritch R, Panda-Jonas S. Glaucoma. *Lancet* 2017;390(10108):2183-2193.

3 Tham YC, Li X, Wong TY, Quigley HA, Aung T, Cheng CY. Global prevalence of glaucoma and projections of glaucoma burden through 2040:a systematic review and meta-analysis. *Ophthalmology* 2014;121(11):2081-2090.

4 Prum BE, Rosenberg LF, Gedde SJ, Mansberger SL, Stein JD, Moroi SE, Herndon LW, Lim MC, Williams RD. Primary open-angle glaucoma preferred practice pattern(®) guidelines. *Ophthalmology* 2016;123(1):P41-P111.

5 Fankhauser F, Koch P, Roulier A. On automation of perimetry. *Graefes Arch Clin Exp Ophthalmol* 1972;184(2):126-150.

6 Bebie H, Fankhauser F, Spahr J. Static perimetry: strategies. *Acta Ophthalmol* 2009;54(3):325-338.

7 Pierre-Filho Pde T, Schimiti RB, de Vasconcellos JP, Costa VP. Sensitivity and specificity of frequency-doubling technology, tendency-oriented perimetry, SITA Standard and SITA Fast perimetry in perimetrically inexperienced individuals. *Acta Ophthalmol Scand* 2006;84(3):345-350.

8 Johnson CA, Adams CW, Lewis RA. Fatigue effects in automated perimetry. *Appl Opt* 1988;27(6):1030-1037.

9 Hudson C, Wild JM, O'Neill EC. Fatigue effects during a single session of automated static threshold perimetry. *Invest Ophthalmol Vis Sci* 1994;35(1):268-280.

10 Bengtsson B, Heijl A, Olsson J. Evaluation of a new threshold visual field strategy, SITA, in normal subjects. Swedish Interactive Thresholding Algorithm. *Acta Ophthalmol Scand* 1998;76(2):165-169.

11 Bengtsson B, Heijl A. Evaluation of a new perimetric threshold strategy, SITA, in patients with manifest and suspect glaucoma. *Acta Ophthalmol Scand* 1998;76(3):268-272.

12 Budenz DL, Rhee P, Feuer WJ, McSoley J, Johnson CA, Anderson DR. Sensitivity and specificity of the Swedish interactive threshold algorithm for glaucomatous visual field defects. *Ophthalmology* 2002;109(6):1052-1058.

13 Wall M, Woodward KR, Brito CF. The effect of attention on conventional automated perimetry and luminance size threshold perimetry. *Invest Ophthalmol Vis Sci* 2004;45(1):342.

14 Heijl A. Time changes of contrast thresholds during automatic perimetry. *Acta Ophthalmol* 1977;55(4):696-708.

15 Heijl A, Drance SM. Changes in differential threshold in patients with glaucoma during prolonged perimetry. *Br J Ophthalmol* 1983;67(8):512-516.

16 Johnson CA, Chauhan BC, Shapiro LR. Properties of staircase procedures for estimating thresholds in automated perimetry. *Invest Ophthalmol Vis Sci* 1992;33(10):2966-2974.

17 Bengtsson B, Olsson J, Heijl A, Rootzén H. A new generation of algorithms for computerized threshold perimetry, SITA. *Acta Ophthalmol Scand* 1997;75(4):368-375.

18 Bengtsson B, Heijl A. SITA Fast, a new rapid perimetric threshold test. Description of methods and evaluation in patients with manifest and suspect glaucoma. *Acta Ophthalmol Scand* 1998;76(4):431-437.

19 Johnson CA. Recent developments in automated perimetry in glaucoma diagnosis and management. *Curr Opin Ophthalmol* 2002;13(2):77-84.

20 Wild JM, Pacey IE, Hancock SA, Cunliffe IA. Between-algorithm, between-individual differences in normal perimetric sensitivity: full threshold, FASTPAC, and SITA. Swedish Interactive Threshold algorithm. *Invest Ophthalmol Vis Sci* 1999;40(6):1152-1161.

21 Wild JM, Pacey IE, O'Neill EC, Cunliffe IA. The SITA perimetric threshold algorithms in glaucoma. *Invest Ophthalmol Vis Sci* 1999;40(9):1998-2009.

22 Aoki Y, Takahashi G, Kitahara K. Comparison of Swedish interactive threshold algorithm and full threshold algorithm for glaucomatous visual field loss. *Eur J Ophthalmol* 2007;17(2):196-202.

23 Saunders LJ, Russell RA, Crabb DP. Measurement precision in a series of visual fields acquired by the standard and fast versions of the Swedish interactive thresholding algorithm: analysis of large-scale data from clinics. *JAMA Ophthalmol* 2015;133(1):74-80.

24 Heijl A, Patella VM, Chong LX, Iwase A, Leung CK, Tuulonen A, Lee GC, Callan T, Bengtsson B. A new SITA perimetric threshold testing algorithm: construction and a multicenter clinical study. *Am J Ophthalmol* 2019;198:154-165.

25 Wu Z, Medeiros FA. Recent developments in visual field testing for glaucoma. *Curr Opin Ophthalmol* 2018;29(2):141-146.

26 Stanley J, Huisingh CE, Swain TA, McGwin G, Owsley C, Girkin CA, Rhodes LA. Compliance with primary open-angle glaucoma and primary open-angle glaucoma suspect preferred practice patterns in a Retail-based eye clinic. *J Glaucoma* 2018;27(12):1068-1072.

27 European Glaucoma Society Terminology and Guidelines for Glaucoma, 4th Edition - Chapter 3: Treatment principles and options Supported by the EGS Foundation: Part 1: Foreword; Introduction; Glossary; Chapter 3 Treatment principles and options. *Br J Ophthalmol* 2017;101(6):130-195.

28 Groen F, Ramdas W, de Hoog J, Vingerling JR, Rothova A. Visual outcomes and ocular morbidity of patients with uveitis referred

to a tertiary center during first year of follow-up. *Eye* (*Lond*) 2016;30(3):473-480.

29 Lindén C, Bengtsson B, Alm A, Calissendorff B, Eckerlund I, Heijl A. Glaucoma management in Sweden — results from a nationwide survey. *Acta Ophthalmol* 2013;91(1):20-24.

30 Quigley HA, Friedman DS, Hahn SR. Evaluation of practice patterns for the care of open-angle glaucoma compared with claims data: the glaucoma Adherence and Persistency Study. *Ophthalmology* 2007;114(9):1599-1606.

31 Phu J, Khuu SK, Agar A, Kalloniatis M. Clinical evaluation of Swedish interactive thresholding algorithm-faster compared with Swedish interactive thresholding algorithm-standard in normal subjects, glaucoma suspects, and patients with glaucoma. *Am J Ophthalmol* 2019;208:251-264.

32 Gazzard G, Foster PJ, Viswanathan AC, Devereux JG, Oen FT, Chew PT, Khaw PT, Seah SK. The severity and spatial distribution of visual field defects in primary glaucoma: a comparison of primary open-angle glaucoma and primary angle-closure glaucoma. *Arch Ophthalmol* 2002;120(12):1636-1643.

33 Kelly SR, Bryan SR, Crabb DP. Does eye examination order for standard automated perimetry matter? *Acta Ophthalmol* 2019;97(6): e833-e838.

34 Conway ML, Hosking SL, Zhu H, Cubbidge RP. Does the Swedish Interactive Threshold Algorithm (SITA) accurately map visual field loss attributed to vigabatrin? *BMC Ophthalmol* 2014;14:166.

35 Phu J, Kalloniatis M, Khuu SK. Reducing spatial uncertainty through attentional cueing improves contrast sensitivity in regions of the visual field with glaucomatous defects. *Transl Vis Sci Technol* 2018;7(2):8.

36 Artes PH, Iwase A, Ohno Y, Kitazawa Y, Chauhan BC. Properties of perimetric threshold estimates from Full Threshold, SITA Standard, and SITA Fast strategies. *Invest Ophthalmol Vis Sci* 2002;43(8):2654-2659.

37 Heijl A, Bengtsson B, Patella VM. Glaucoma follow-up when converting from long to short perimetric threshold tests. *Arch Ophthalmol* 2000;118(4):489-493.

38 Tan NYQ, Friedman DS, Stalmans I, Ahmed IIK, Sng CCA. Glaucoma screening: where are we and where do we need to go? *Curr Opin Ophthalmol* 2020;31(2):91-100.