SENSITIVITY TO GLAUCOMATOUS VISUAL FIELD LOSS IN FULL THRESHOLD, SITA STANDARD, AND SITA FAST TESTS

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Abstract

Using a newly collected normal database of visual fields obtained with the Swedish Interaction Threshold Algorithm-Standard (SITA-S), SITA Fast, and Full Threshold Programs, inter-subject variability and significance limits for deviation of threshold values were calculated and compared. Average inter-subject variance was 69% smaller with SITA-S and 59% smaller with SITA Fast compared with Full Threshold, resulting in narrower normal limits for both SITA programs than for Full Threshold. The number of significantly depressed points and individual mean light sensitivity were then compared in 44 glaucomatous eyes of 44 patients with one test each of the SITA-S, SITA Fast and Full Threshold strategies. SITA-S showed the highest number of significantly depressed points, at both the highest \( p<5\% \) level and lowest \( p<0.5\% \) level, and Full Threshold the lowest number of such points, while Full Threshold showed lowest, and SITA Fast highest mean light sensitivity. Thus, glaucomatous visual field defects detected by both versions of SITA were at least as extensive as those obtained with Full Threshold despite the fact that SITA’s higher light sensitivity made field defects less obvious in gray scales.

Introduction

The new shorter SITA strategies have been shown to be at least as reproducible as those they were intended to replace, i.e., Humphrey’s Full Threshold and Fastpac programs. At the same time, they reduce test duration by almost 50%\(^1,2\). Test results, however, often look ‘healthier’ with SITA than those obtained with the more time-consuming Full Threshold Program when evaluation uses simple gray scales. These differences are most obvious when comparing Full Threshold results with SITA Fast tests. The ability of any test algorithm to detect field loss depends directly on the variability of the results in normal subjects, which defines the limits of normality of the algorithm. Thus, we determined significance limits for normal variability in SITA, and then evaluated the sensitivity of the new strategies to glaucomatous field loss.

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Methods

A multi-center collection of normal data was performed with the new SITA-S, SITA Fast, and the old Full Threshold algorithms using the 30-2 test point pattern. The results were used to calculate age-dependent normal threshold values. Inter-subject variability was used to determine significance limits for deviations from these normal values. These limits were based on encountered threshold distributions at each test point, using the same statistical technique as that used in the original Statpac® for Full Threshold.

Results

Inter-subject variance was smaller using both SITA-S \((p=0.003)\) and SITA Fast \((p<0.0001)\) compared to Full Threshold. The average variance over all tested points was 69% with SITA-S and 59% with SITA Fast of that obtained in Full Threshold tests.

Age-corrected normal threshold values were higher with both SITA-S and SITA Fast than with Full Threshold (Fig. 1). The \(p<5\%\) and \(p<0.5\%\) significance limit profiles were closer to the age-corrected normal threshold value, indicating narrower limits for normality than those found with Full Threshold. The pattern deviation \(p<5\%\) limits were, on average, 22% narrower with SITA-S and 29% narrower when using SITA Fast, compared to Full Threshold. The \(p<0.5\%\) pattern deviation limits were 18% narrower with SITA-S and 27% narrower with SITA Fast than with Full Threshold results.

Evaluation

One eye of each of 44 glaucoma patients was examined with each of the Full Threshold, SITA-S, and SITA Fast strategies. Average differential light sensitivity and number of significantly depressed points at the \(p<5\%\) and \(p<0.5\%\) levels in pattern deviation probability maps were calculated. Average light sensitivity was highest using the shortest SITA Fast and lowest in the longest Full Threshold program. The number of significantly depressed points was higher in results from both SITA strategies than with the Full Threshold strategy. All differences between SITA and Full Threshold were highly significant (Table 1).

Table 1. Comparison between different test strategies in 44 glaucoma eyes

<table>
<thead>
<tr>
<th>Test time</th>
<th>Mean sensitivity</th>
<th>No. of points</th>
<th>No. of points</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(dB)</td>
<td>(p&gt;5%) (average/eye)</td>
<td>(p&lt;0.5%) (average/eye)</td>
</tr>
<tr>
<td>SITA Standard</td>
<td>9.2</td>
<td>20.0</td>
<td>30.3</td>
</tr>
<tr>
<td>SITA Fast</td>
<td>5.8</td>
<td>21.0</td>
<td>30.8</td>
</tr>
<tr>
<td>Full Threshold</td>
<td>16.6</td>
<td>17.6</td>
<td>27.5</td>
</tr>
</tbody>
</table>
Fig. 1. Age-corrected normal threshold values, and 5% and 0.5% pattern deviation significance limits along the horizontal meridian for the Full Threshold, SITA-S, and SITA Fast algorithms.
Fig. 2. Test results from one eye. Field defects differ in the gray scale representations with SITA Fast field appearing least abnormal, but the defects are more similar in the probability maps.
Conclusions

Average light sensitivity is higher, inter-subject variability smaller, and limits for normality narrower with SITA tests than with the Full Threshold Program. SITA testing yields at least as much significant field loss as the Full Threshold test in glaucoma. This is true, despite the fact that field defects sometimes appear smaller and/or shallower in SITA gray scale print-outs, particularly when SITA Fast has been used (Fig. 2). The results may be explained by smaller visual fatigue effects in the shorter SITA tests, but might also be due partly to higher accuracy of threshold estimates in the SITA test algorithms.

Acknowledgments


References