Effect of age related macular degeneration on the Eger macular stressometer photostress recovery time


Aim: To assess the repeatability of Eger macular stressometer (EMS) measures of photostress recovery and determine their association with other measures of visual function.

Methods: EMS photostress recovery time was measured in 90 patients with bilateral exudative age related macular degeneration (AMD), 19 with bilateral atrophic AMD and 47 with both forms of the condition (mean age 79 (SD 13) years). Measurements were made on two occasions separated by 1 year. Inter-assessor repeatability was assessed by repeating the measures after a 10 minute recovery period at the first visit. Distance visual acuity was measured with a logMAR chart, near visual acuity with a MNRead chart at 25 cm, contrast sensitivity with a Pelli-Robson chart, and the presence of central visual disturbance assessed with an Amsler grid. A questionnaire was used to assess self reported difficulties with glare recovery.

Results: The average EMS recovery time was 11.0 (SD 8.9) seconds, decreasing by 1.6 (5.2) seconds on repeated measurement (p<0.05). EMS photostress recovery was not correlated with visual function measures or subjective difficulties with lights (p>0.05). EMS photostress recovery time did not predict those whose vision decreased over the following year compared with those among whom it remained stable.

Conclusions: The EMS test is not a useful tool in determining the severity or progression of AMD.

Methods

The mean age of the 156 participants recruited from the Queen’s Medical Centre, Nottingham was 78.96 (SD 6.64) years (64% female). Patients were considered suitable if they had AMD irrespective of severity or duration, treated or untreated, in one (n=6; 3.8%) or both eyes. Exclusion criteria were eye disease other than AMD and inability to understand or speak English. Ninety people (57.7%) had bilateral exudative AMD, 19 (12.2%) had atrophic AMD and the remaining patients a combination of both forms of the condition (mean age 79 (SD 13) years (64% female). The correlation between subjective reported glare problems and EMS photostress recovery time and the ability of the EMS to predict those whose visual acuity or contrast sensitivity will deteriorate over the subsequent year were also determined.

METHODS

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Abbreviations: AMD, age related macular degeneration; EMS, Eger macular stressometer
was immediately repositioned at 40 cm and time until the patient could read print one line (0.1 logMAR) larger than their pre-exposure visual acuity was measured. The measurement was repeated after a 10 minute recovery period to allow retinal re-adaptation following bleaching.13 15

Distance and near (25 cm working distance) visual acuity was measured using Bailey-Lovie logMAR charts. Contrast sensitivity was assessed using Pelli-Robson charts and the presence of central distortion or scotoma with an Amsler grid. Subjective difficulties with vision in bright sunlight, adapting to bright sunlight, adapting to dim light, being dazzled by bright lights and having to shade their eyes because of excessive light were each rated on a six point scale.

The EMS recovery time and visual function assessment was remeasured after 1 year in 135 participants. Progression of distance visual acuity was taken as a reduction in logMAR of >0.1 units (95% confidence interval of repeatability).16 Progression of contrast sensitivity loss was taken as a reduction exceeding 0.3 Pelli-Robson log units (95% confidence interval of repeatability).16 All results are presented as means (SD).

TABLE 1

<table>
<thead>
<tr>
<th></th>
<th>Exudative AMD</th>
<th>Atrophic AMD</th>
<th>Mixed AMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance visual acuity (logMAR)</td>
<td>0.60 (0.39)</td>
<td>0.08 (0.39)</td>
<td>0.07 (0.38)</td>
</tr>
<tr>
<td>Contrast sensitivity (log units)</td>
<td>0.87 (0.45)</td>
<td>1.14 (0.45)</td>
<td>1.26 (0.29)</td>
</tr>
<tr>
<td>Near visual acuity (logMAR)</td>
<td>0.54 (0.43)</td>
<td>0.31 (0.48)</td>
<td>0.23 (0.23)</td>
</tr>
<tr>
<td>Central visual field defect (%)</td>
<td>45</td>
<td>42</td>
<td>44</td>
</tr>
<tr>
<td>EMS recovery time (seconds)</td>
<td>10.1 (8.7)</td>
<td>14.7 (10.6)</td>
<td>11.3 (8.6)</td>
</tr>
</tbody>
</table>

RESULTS

Averaged across the full sample of patients, EMS recovery time was 11.0 (SD 8.9) seconds. The visual function of the three AMD groups is given in table 1. The relation between visual acuity and EMS result is shown in figure 1. EMS recovery time was 1.6 (5.2) seconds shorter on intrasession repeated measure (p<0.05). Initial EMS photostress recovery was not correlated with distance visual acuity in all three AMD groups (p=0.05). This was also the case for contrast sensitivity (fig 2) and near visual acuity. Those patients with a central visual field defect or distortion had a similar EMS photostress recovery time as those with an intact central visual field in exudative (p=0.56), atrophic (p=0.38), or mixed AMD (p=0.10). Subjective difficulties with vision were unrelated to EMS photostress recovery time in all three AMD groups (p>0.05).

EMS recovery time and visual function were assessed again after a 1 year period. There was no difference in the initial EMS photostress recovery time among patients with exudative AMD whose distance visual acuity (10.6 (8.7) v 7.9 (3.4) seconds, p=0.15) or contrast sensitivity (10.8 (9.4) v 11.1 (7.5) seconds, p=0.92) deteriorated compared with those among whom these two measures remained stable. There was also no difference between the change in EMS photostress recovery time over 1 year in those with exudative AMD whose distance visual acuity (3.3 (10.9) v 2.0 (4.1) seconds, p=0.28) or contrast sensitivity (4.3 (9.4) v 4.1 (9.1) log units, p=0.99) deteriorated compared with those in whom these two measures remained stable. Too few patients in the atrophic or mixed AMD groups had a decrease in distance visual acuity or contrast sensitivity (n=4/3 and n=11/3, respectively) for a statistical analysis to be performed.

DISCUSSION

Our results provide no evidence that EMS photostress recovery time is affected by AMD, contrary to previous reports using other photostress techniques.6–9 11 12 Indeed, the average EMS recovery time in our study was similar to that found in previous studies using similar short exposure flash in healthy patients.11 12 The EMS mean recovery time is generally lower than that obtained with other techniques for measuring photostress recovery time,1 13 14 15 18 which suggests the device does not bleach sufficient photopigment to challenge outer retinal physiology and hence identify people with AMD. The coefficient of repeatability of 10.2 seconds in the Bartlett study found significantly longer recovery times in patients with AMD. We are unable to speculate on the differences between these studies, as the central field status of patients was not

Figure 1

Figure 2

Table 1 Visual function of the three age related macular degeneration (AMD) groups
The effect of pupil size is limited. However, the EMS test has a high repeatability limits the sensitivity of the test.

The EMS photostress recovery was not correlated with visual function measures or subjective difficulties with lights and changing light conditions in AMD. There was also no difference in the initial EMS photostress recovery time or change over a year in recovery time among those whose vision decreased over the following year compared with those among whom it remained stable. It would therefore appear that photostress recovery time as assessed by the EMS test is not a useful tool in determining either the severity or the progression of AMD.

The transient state of insensitivity subjectively perceived after photostress is experienced as a scotomatous afterimage. The amount of photopigment bleached is dependent on the intensity and duration of the flash. In addition, pupil size and eccentricity of viewing will affect the result. Elderly patients tend to have smaller pupils and therefore may need longer exposure to the light source for the photoreceptors to be fully bleached. Furthermore, patients with AMD often adopt eccentric viewing and therefore the effect may be further reduced. As such, redesign of the test with a longer flash duration of greater visual angle may be appropriate. Bleaching the photoreceptors with a direct ophthalmoscope may be appropriate. Hence, despite the negative findings of this study, if redesign and further development of the EMS test could produce associations with the severity and progression of AMD, it may be an attractive test in clinical practice.

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The authors have no commercial interest in the EMS test.

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REFERENCES