CLINICAL STUDY

How good are we at assessing driving visual fields in diabetics?

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Abstract

Purpose/background **Following laser panretinal photocoagulation (PRP) for proliferative diabetic retinopathy, patients are at risk of failing the UK driving visual field test due to loss of peripheral field. Although a definition of the minimum field requirement exists, differences in its interpretation may influence whether fields pass or fail. Currently it is not known how fields are interpreted in practice nor to what extent this affects failure rates.**
Methods **Uniocular and binocular Esterman visual fields from 60 diabetic patients following PRP were examined both by the chairman of the Visual Standards Sub-Committee of the Royal College of Ophthalmologists and separately by four consultant ophthalmologists. The results were analysed (1) to assess the extent of agreement and (2) to identify, from the chairman's results, the field deficits that are still compatible with passing.**
Results **Agreement was generally good for binocular fields but was only moderate for uniocular fields. In up to 15% of binocular fields and 43% of uniocular fields the chairman's decision was different from that of the consultants. Several key aspects of the field that influence a pass/fail decision are identified.**
Conclusions **Substantial differences in the assessment of driving visual fields following RPR currently exist between consultants and the chairman of the Visual Standards Sub-Committee. Using the information presented here to guide assessment it is now possible to reduce this variation.**

Key words Driving, Panretinal photocoagulation, Visual fields

Panretinal laser photocoagulation (PRP) for proliferative diabetic retinopathy is recognised as carrying a significant risk of jeopardising a patient's right to drive by causing a reduction in the peripheral visual field.[1-5] The Driver and Vehicle Licensing Agency (DVLA) bases its driving visual field requirement[6] on the Royal College of Ophthalmologists 'Definition of the minimum field of vision for safe driving',[7] which states that patients should have a field of at least 120° on the horizontal, that there should be no significant field defect within 20° of fixation either above or below the horizontal meridian and that there should be no significant scotoma close to fixation.

Deciding, for example, how rigidly the requirement for horizontal field should be applied and what constitutes a significant field defect or scotoma requires a degree of interpretation of the standard. Both the present and a previous chairman emphasise that the recommendations should not be applied in an unduly restrictive manner.[4,8] Although fields that are found difficult to assess may be referred to the Visual Standards Sub-Committee, the majority of fields are not examined in this way. It is possible that variation in assessment may deprive some patients of their licence to drive whilst allowing others to continue despite having inadequate visual field.

To establish how well visual fields are assessed in practice requires information on what field loss is considered acceptable within the definition of the minimum driving visual field. This information is currently unavailable. We have therefore undertaken a study (1) to look at the results of field assessment carried out by the chairman of the Visual Standards Sub-Committee to identify the aspects of the field that guide the decision on whether a field passes or fails and (2) to try to establish how well fields are currently interpreted in practice.

Methods

Visual field assessment was carried out on diabetic patients who had received laser PRP for proliferative retinopathy. Patients eligible for inclusion in the study were diabetics whose Snellen visual acuity following treatment was at least 6/12 in the treated eye (or in the better eye if the patient received bilateral treatment). This level was chosen as a suitable approximation to that required by the DVLA for holding a Group 1 driving licence which states that 'a driver must be able to read a vehicle registration plate at 20.5 m in good daylight'.[6] This has been shown to equate to a binocular Snellen visual acuity of approximately 6/10,[9] and eligible patients would therefore be unlikely to be barred from driving on the grounds of poor visual acuity.

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Table 1. *Summary of failure rates for the chairman of the Visual Standards Sub-Committee and four consultants*

Type of field	Chairman's failure rate	Consultants' failure rates
Binocular: one eye treated	5%	Mean 2.5% (range 0–5%)
Binocular: both eyes treated	12%	Mean 14% (range 6–26.5%)
Uniocular: treated eyes	43%	Mean 52% (range 36–68.5%)

Patients were identified retrospectively by case note review, using computerised records of patients receiving PRP. Patients were included who had had either unilateral and bilateral treatment, with or without additional focal laser. Patients with coexistent disease known to cause visual field loss were excluded.

Visual field assessment was carried out using the Esterman Visual Field Test (EVFT) program of the Humphrey visual field analyser. This test, which may be binocular or uniocular, provides a printout field and a field test score that is weighted for those areas of the field considered important for driving.[10] Greater weight is given to central than peripheral areas and weighting is higher in the inferior than the superior field. One hundred points are shown in the uniocular field, 120 in the binocular field and the EVFT score is a percentage value of the number of points seen as a proportion of the total shown.

With normal visual fields a patient will pass this test with each eye individually. Those with a reduction in the visual field following treatment may fail with an individual eye but pass if assessed binocularly. Given, therefore, that a higher proportion of uniocular fields are likely to be borderline, we examined not only binocular fields, which are generally used when assessing a patient's right to drive, but also uniocular fields, as these were likely to yield further information on the aspects that determine a pass or fail result.

All visual fields were examined first by the chairman of the Visual Standards Sub-Committee and then, independently and without discussion, by each of the four consultant ophthalmologists responsible for the care of any of the treated patients, using the 1994 Royal College of Ophthalmologists definition for the minimum field for safe driving. The fields were presented in a random order with patient details deleted. Any field test considered by the chairman to be unreliable, for example due to a high number of fixation losses or false positive or negative errors, was repeated.

Table 2. *Interpretation of the kappa (κ) score*

Value of κ	Strength of agreement
< 0.20	Poor
0.21–0.40	Fair
0.41–0.60	Moderate
0.61–0.80	Good
0.81–1.00	Very good

The results were then analysed both for the amount of agreement between the consultants and the chairman, and also to identify the aspects of the fields that might most strongly influence a pass or fail result: the field test score, the extent of the horizontal field, the extent of the vertical field, and the number of points missed within different parts of the field, especially around fixation.

Results

A total of 55 binocular and 86 uniocular Esterman visual field tests from 60 patients was examined. The results of assessment by the chairman of the Visual Standards Sub-Committee compared with that of the consultants were as follows:

1. Of 21 binocular fields in which only one eye had been treated the chairman failed 5% compared with a mean of 2.5% (range 0–5%) for the consultants.
2. Of 34 binocular fields in which both eyes had been treated the chairman failed 12% compared with a mean of 14% (range 6–26.5%) for the consultants.
3. Of 86 uniocular fields from treated eyes the chairman failed 43% compared with a mean of 52% (range 36–68.5%) for the consultants. Table 1 summarises the results.

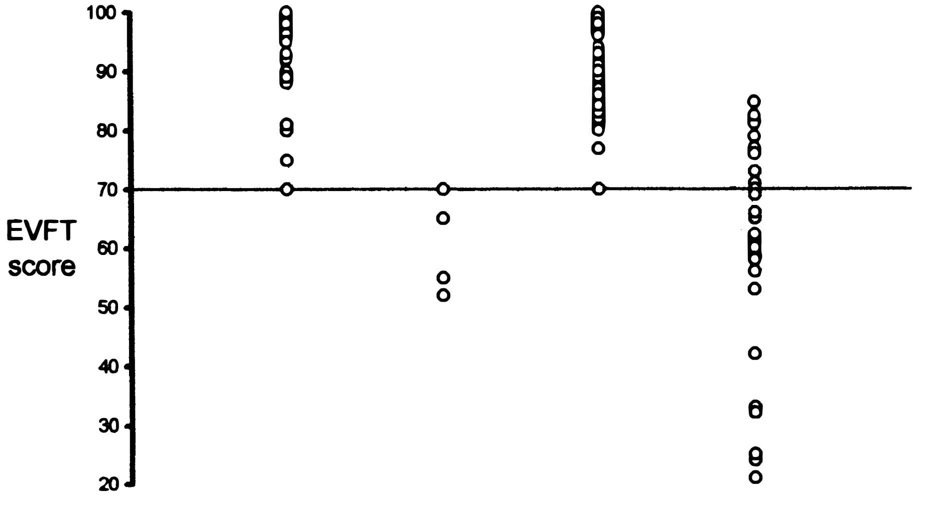
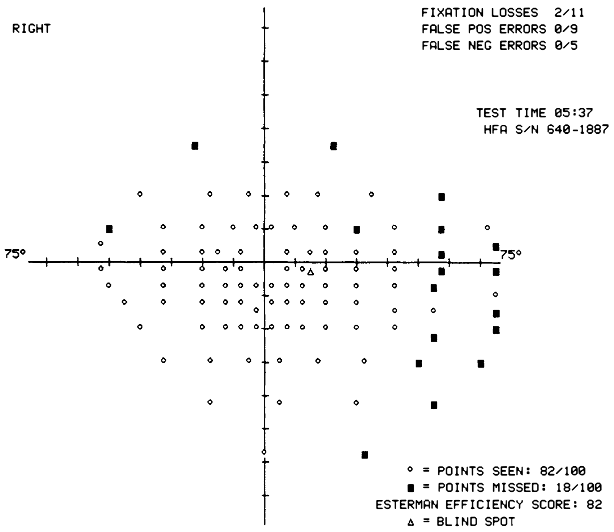


Fig. 1. *Esterman visual field test score for different field types. Left, binocular passes; centre left, binocular fails; centre right, uniocular passes; right, uniocular fails.*



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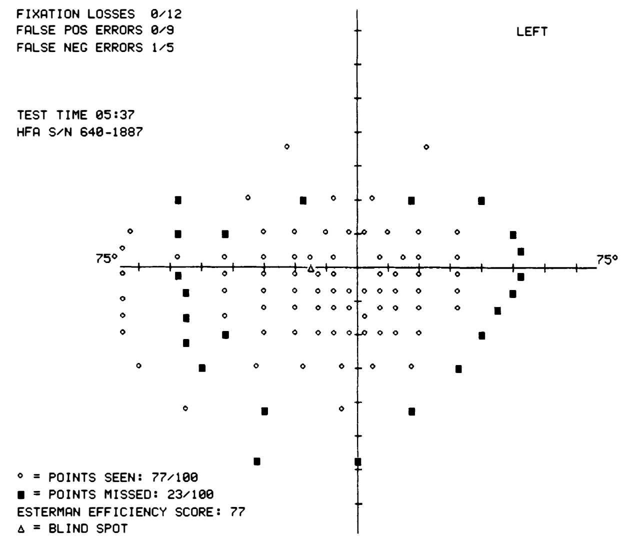

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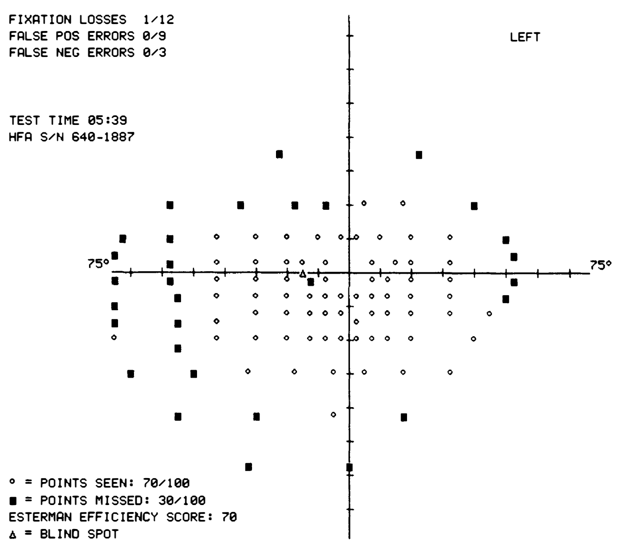


(c)

Fig. 2. *Uniocular fields with loss of horizontal visual field. In (a) there is loss of temporal field whilst in (b) there is loss of nasal field together wtih some loss temporally. Both passed, though in each case a review was recommended after 1 year. The two fixation losses in field (a) was considered acceptable. In (c) there is substantial loss both nasally and temporally and this field failed. For assessment purposes the fields were treated as though the fellow eye had no useful vision and are included only to help establish the limits of visual field loss that are still compatible with passing. In practice most patients are binocular and may well pass even if one or both uniocular fields would have failed.*

The agreement between the four consultants' and the chairman's results varied from 85% to 97% for the binocular fields, and from 57% to 93% for the uniocular fields. Correcting for the considerable agreement that is predicted by chance yielded a mean kappa (κ) value of 0.67 (range 0.55–0.82) and 0.58 (range 0.15–0.85) for the binocular and uniocular fields respectively. Interpretation of these scores is shown in Table 2.

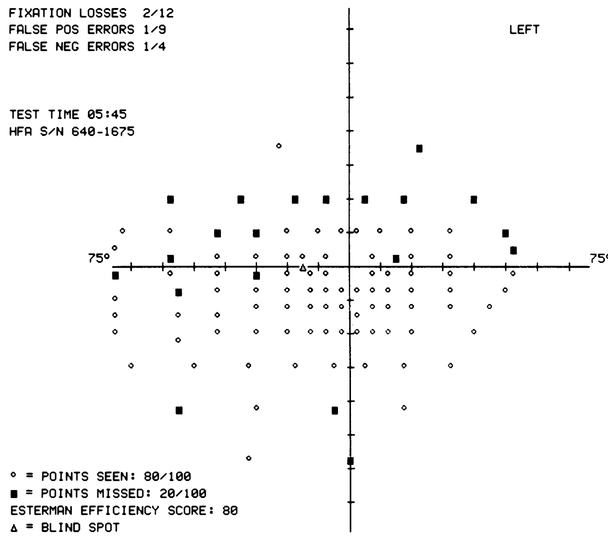
In terms of the impact that assessment by the chairman rather than the consultants would have on the rights of patients to drive, the decision would be different in up to 5% of patients in whom only one eye is treated, in up to 15% of those having bilateral treatment, and theoretically in up to 43% of patients if only a uniocular field test is obtainable as occurs when the fellow eye has no useful vision. In this study 3 patients (5%) were monocular. In most cases the change in the assessment would be in the patient's favour.

For both field groups a strong predictor for failing the test was the EVFT score. No patient with a score of less than 70% passed either the binocular or the uniocular test. Almost one-third of the uniocular fields that scored 70% or more still failed, but for the binocular fields all but one of those with a score of at least 70% passed. The results are shown in Fig. 1.

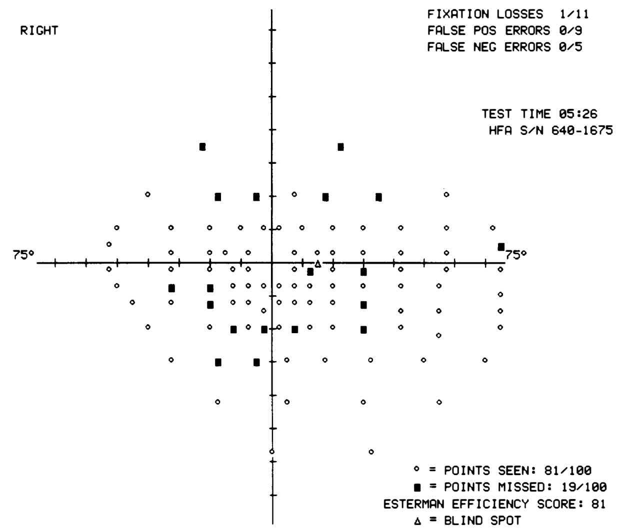
Missing as many as 10 points within the central 120° × 40° was still compatible with passing, as was missing 3 points on a binocular field or 6 points on a uniocular field within the central 80° × 40°. The maximum number missed within the central 40° × 40° whilst still passing was 2. Six per cent of binocular and 12% of uniocular fields that passed did not achieve a horizontal field on the level of fixation of 120°. In contrast, no fields that passed had less than 20° both above and below fixation.

In 11% of fields the chairman considered a high number of fixation losses or false positives or negatives as indicative of an unreliable test, and a repeat field test was therefore carried out. Almost all accepted fields had 3 fixation losses or fewer.

The chairman varied the length of time a pass result was valid. In 30% of binocular fields and 41% of uniocular fields review was recommended after 1 year, whilst in the rest it was unrestricted.



(a)



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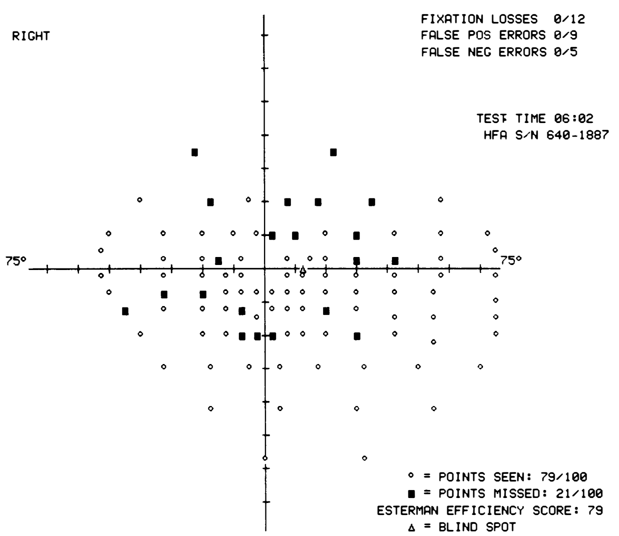


(c)

Fig. 3. *Uniocular fields with adequate peripheral visual field but points missed centrally. Field (c) with substantial losses, including four within 20° of fixation, failed but fields (a) and (b) with fewer losses, mainly away from fixation, passed.*

Examples of fields assessed, illustrating the findings above, are shown in Figs. 2–4.

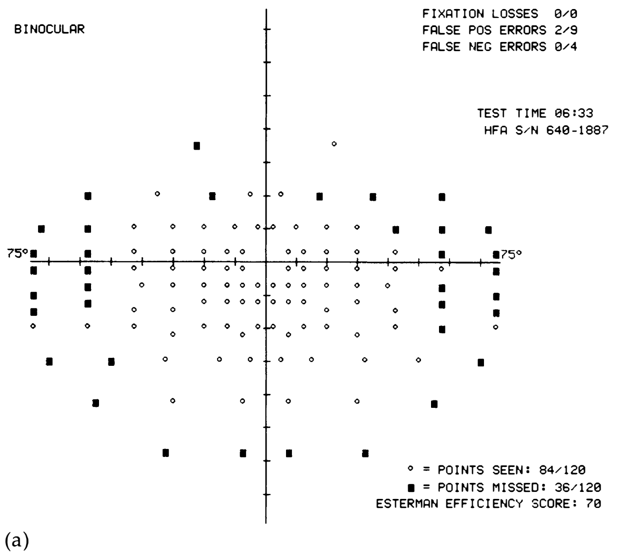
Discussion

Although a definition for the minimum field for safe driving is available, its interpretation remains somewhat subjective. The results of this study provide some guidance on whether the assessment of visual fields in diabetics following RPR is similar between consultant ophthalmologists and the chairman of the Visual Standards Sub-Committee, and indicate the areas that are considered most important in making the decision.

After correcting for chance, and recognising the limitations of κ statistic interpretation,[11] our results show that whilst there was generally good agreement on the binocular fields, there was only moderate agreement on the uniocular fields. The substantial amount of variation between the consultants indicates that significant differences in interpretation currently exist.

The consultants had a similar rate of failure to the chairman for binocular fields but were more strict on the uniocular fields. Nevertheless, in up to 5% of those with unilateral and 15% of those with bilateral treatment the chairman's decision on the binocular fields was different from that of the consultants. The greatest variation (43%) occurs in those in whom only a uniocular field is available. In this study all but 3 patients had a fellow eye with useful vision, so the impact of such a wide variation would have been small.

In terms of the specific field attributes considered, several features emerge. The EVFT score strongly predicts the chances of passing or failing, with the apparent cut-off for passing at 70% probably reflecting the fact that approximately this proportion of the test points lie on or within a field of 120° × 40°. However, the presence of a vertical field of at least 20° above and below fixation appears more important than a horizontal field of 120°. Likewise, although many patients missed points within a field of 120° × 40°, fewer missed points were tolerated the closer they lay to fixation, and within the central 40° × 40° it is apparent that 2 or more adjacent points is considered a significant scotoma.



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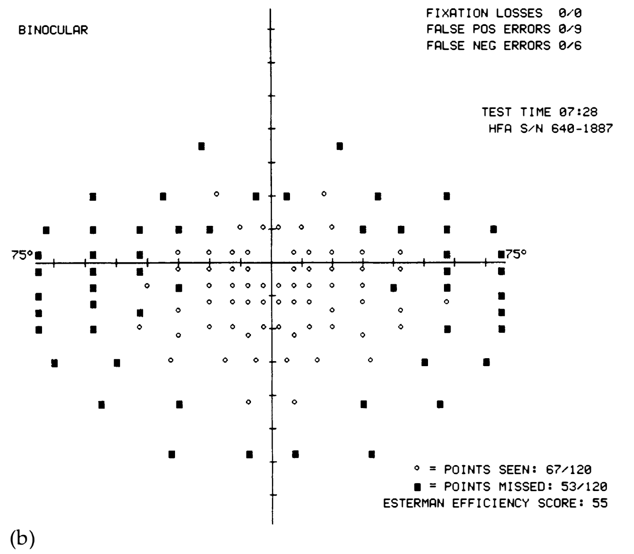

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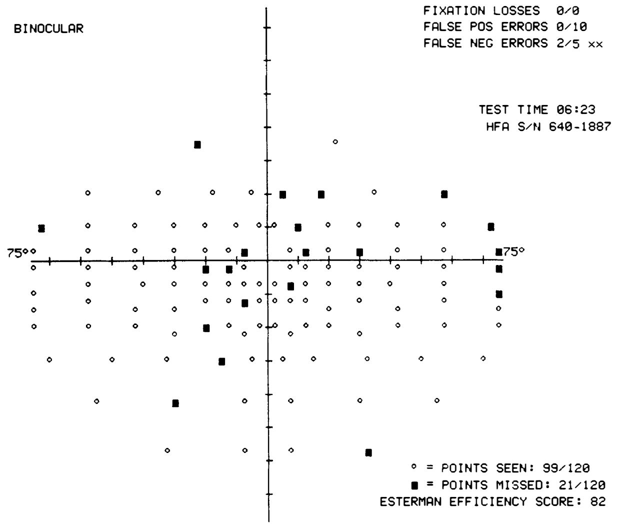

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Fig. 4. *Binocular fields. In (a) the lack of 120° of horizontal field did not prevent the field from passing, but field (b), with more extensive constriction, failed. Field (c), with numerous points missed within 20° of fixation, would have failed, but the two false negative errors indicated lack of concentration and the patient passed on repeat testing. However, this was unusual; most patients requiring repeat testing did not improve substantially.*

The results show that having a highly reliable field is considered important before making any assessment and that repeat testing after 1 year is appropriate in many borderline cases.

Our results demonstrate that substantial differences in the assessment of driving visual fields following PRP currently exist between consultants and the chairman of the Visual Standards Sub-Committee. Greater knowledge of the factors considered most important in making the assessment may now reduce this variation. Although our results are only for patients following PRP it is likely that the principles outlined are more generally applicable to those patients requiring driving visual field tests for other conditions.

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