Reviewer's report

Title: Influence of retinopathy in the achromatic and chromatic vision of patients with type 2 diabetes

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Title: Influence of retinopathy in the achromatic and chromatic vision of patients with type 2 diabetes
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Abstract:
(See some suggested changes to abstract)

Background: Achromatic contrast sensitivity (CS) and color vision (CV) are considered to have great predictive value in the evaluation of type 2 diabetic retinopathy. However, these two visual dimensions have seldom been investigated in the same group of patients. In the present study we measured CS and CV in a group of patients with type 2 diabetes and correlated the results with estimates of common metabolic markers for the disease. A subgroup of patients had no clinical signs of retinopathy.

Methods: The vision of twenty-seven patients (n = 50 eyes) suffering from type 2 diabetes, with retinopathy (n = 20 eyes) or without retinopathy (n = 30 eyes), were evaluated using two psychophysical tests: Farnsworth-Munsell 100 hue test (FM 100); and measurement of the luminance contrast sensitivity at 11 spatial frequencies. The results were compared with measurements obtained with an age-matched control group (n = 32) and correlated with the level of glycated
hemoglobin, glycemic level, and time of disease. Any signs of retinopathy were identified during the ophthalmological examination.

Results: Contrast sensitivity and color vision impairments were present in different degrees in diabetes patients. Eyes with retinopathy yield more severe loss than eyes without retinopathy. FM 100 test was more sensitive to separate patients and controls. Color vision loss had no color axes preference. The contrast sensitivity test appears to have some advantage in differentiating patients with retinopathy from patients without retinopathy.

Conclusions: Both methods can be useful to follow the visual function of diabetic patients and should be used together to discriminate patients and controls as well as to identify early signs of retinal damage.

Comments on manuscript

The study reports results for contrast sensitivity (CS) and colour vision (CV) tests in a group of patients with type 2 diabetic retinopathy. The selected patients fall into two subgroups:

a. those with clear clinical signs of retinopathy, and
b. those without.

In addition to comparing the relative merits of CS and CV, the authors also examine the correlation with principal metabolic markers in patients with type 2 diabetes.

The authors report interesting and useful findings, but the script has grammatical errors and spelling mistakes and would benefit from thorough editing.

Some of the comments are too generalised, e.g., These two procedures should be better studied to determine their specificity and sensitivity to diabetic retinopathy. One must distinguish between chromatic and achromatic mechanism and the ability to use achromatic and colour tests of CS and CV that will differ widely in sensitivity and this in turn may affect specificity in relation to detection of abnormal changes that can be linked to the earliest vision losses in diabetes.

The authors employ the Ishihara plates test to exclude congenital deficiency. How specific is the Ishihara plates test at differentiating between acquired and congenital loss of red – green colour vision?

State type of LCD monitor / manufacturer / grey levels per gun / and calibration procedure.

The 100 Hue test is also simulated on a visual display. One must be more specific as to what one means by 30% colour saturation. Is the display based 100 Hue simulation equivalent to the Munsell based 100 hue test illuminated with D65? If not, the differences should be discussed briefly in relation to acquired loss. Also, some explanation as to how the log of the 100 hue score captures red – green and yellow – blue losses.

The loss of contrast sensitivity is surprisingly small when the diabetics and
compared to normal subjects. The variability is also very large. This may be because of the large stimulus size employed in the test and differences in criteria when sinusoidal gratings are employed. To add value to the manuscript, it may be worth commenting on the advantages / disadvantages of using gratings and a number of different spatial frequencies (which for the patient is a long and demanding test) or letter s / Landolt rings of fixed size and variable contrast (which is a more reliable and rapid test). Such a comparison is likely to be of interest to clinicians / ophthalmologists. One thing that emerges clearly from the study are the difficulties and variability of the 100-hue and CS test with sinusoidal gratings. Definitely worth more in depth discussion. It is also difficult to understand what is really useful in showing the differences in the ellipse plots in Fig. 3c. More discussion is needed to show the benefits.

In conclusion, the paper makes a useful contribution to our understanding of CS and CV changes in diabetes, but the discussion is not sufficiently critical of the techniques employed and the value of the results obtained. It would be useful to acknowledge and compare other tests of CS and CV (such as the Pelli-Robson test chart, CRS and the CAD test which is also used widely in clinical work) which may yield more useful results in diabetes and are also easier to use and the results easier to interpret.

Greater criticism is also needed when examining the correlation between CS and CV losses and changes in metabolic markers. If there is little or no correlation, one should say so and attempt to account for such findings.

**Level of interest:** An article of importance in its field

**Quality of written English:** Needs some language corrections before being published

**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Declaration of competing interests:**

None