

Acquired colour vision loss in subjects with ARMD.

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ARMD is a slow, degenerative disease that produces gradual structural changes in the retina causing deterioration of vision and blindness. It is caused by changes in the metabolic state of the retina, resulting in non-inflammatory damage to retinal structures. These changes occur gradually over time and often cause measurable loss of visual performance well before structural changes can be detected reliably using current fundus imaging methods. The aim of this study was to examine the extent to which changes in chromatic and rapid flicker sensitivity can be used to screen for ARMD and to quantify these changes in varying stages of the disease. Asymptomatic subjects and ARMD patients with varying degrees of retinopathy were examined. Chromatic sensitivity was assessed under photopic and high mesopic lighting using the Colour Assessment and Diagnosis (CAD) test (1). We measured both red/green (RG) and yellow/blue (YB) chromatic sensitivity. Similar data measured in 330 normal trichromats provide the statistical limits for RG and YB chromatic sensitivity that define the normal range (2). Achromatic high contrast acuity and flicker sensitivity were also assessed. The results reveal significant loss of RG and YB chromatic sensitivity which in the case of ARMD affects both central and peripheral retina and is not localised to the site of retinopathy (the statistical significance of these changes varies from subject to subject with p values < 0.001). Results also reveal a positive correlation between the degree of retinopathy and increased loss of chromatic sensitivity. Significant loss of rapid flicker sensitivity ($p < 0.01$) was also observed in all subjects diagnosed with ARMD. Preliminary results suggest that the loss of chromatic and flicker sensitivity precedes structural changes in the retina as revealed in conventional fundus imaging. These findings suggest that changes in chromatic and rapid flicker sensitivity can provide sensitive indicators of early retinal changes that lead to retinopathy.

1. J. L. Barbur, A. J. Harlow, and G. T. Plant. Insights into the different exploits of colour in the visual cortex. *Proc.R.Soc.Lond.B.* 258 (1353):327-334, 1994.
2. Rodriguez-Carmona M, Harlow AJ, Walker G, Barbur JL. The Variability of Normal Trichromatic Vision and the Establishment of the 'Normal' Range. *Proceedings of 10th Congress of the International Colour Association, Granada (Granada, 2005)* 2005;979-982.