Stimulus investigative range in the perimetry of retinitis pigmentosa: some preliminary findings

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Abstract. The manipulation of perimetric stimulus parameters over a given dynamic range has been reported to provide diagnostic information additional to that of changes in differential sensitivity. Preliminary studies (Flanagan et al., 1984a) have indicated that the perimetric response in retinitis pigmentosa behaves atypically over a range of stimulus combinations and strategies. The current study investigated the perimetric response of 17 retinitis pigmentosa patients of various genetic types over a range of stimulus parameters (target size, presentation time and background luminance) and test strategies (kinetic and threshold static) using the Octopus automated perimeter, the Goldmann and Tubinger bowl perimeters and the Dicon Autoperimeter 3000. Stato-kinetic dissociation was found to be present with large target sizes at 10 asb and 31.5 asb bowl luminances. Some patients demonstrated enhanced sensitivity to shorter stimulus presentations.

Introduction

It has been suggested over the years that different combinations of stimulus parameters presented by a given instrument can, in certain ocular and/or neurological disorders, be manipulated to provide diagnostic information additional to that obtained from the conventional perimetric examination.

Dubois-Poulsen (1952) and Dubois-Poulsen and Magis (1957) using kinetic perimetry at various stimulus sizes with the Goldmann bowl perimeter (adaptation level 31.5 asb) demonstrated abnormalities of spatial summation in certain disorders which they termed photometric dysharmony. They suggested that such disturbances could occur earlier, and be more pronounced, than the corresponding reduction in the differential threshold. They considered that photometric dysharmony resulted from oedema of the retina or optic nerve. This conclusion was not substantiated by Sloan (1961) and Sloan and Brown (1962) using static perimetry with the Goldmann perimeter. These authors demonstrated photometric dysharmony in achromatopsia but not in central scous retinopathy or in retinitis pigmentosa and concluded that photometric dysharmony occurred when the cone receptor mechanism was impaired. Wilson (1967) demonstrated, at an adaptation level of 674 asb, abnormalities of both spatial and temporal summation in lesions of the post-geniculate pathways and abnormalities of spatial summation, only, in pre-geniculate lesions.
Perimetry performed under various adaptation levels is also believed to provide additional diagnostic information. Greve, Bos and Bakker (1976) demonstrated with the Friedmann Visual Field Analyser that examination by means of comparative mesopic and photopic static perimetry aided the differential diagnosis of maculopathies and central neuropathies. In addition, Paige (1985) using the Humphrey Field Analyser suggested that the detection of ‘subtle’ visual field defects was enhanced at a high background luminance of 315 asb in suspected glaucoma, confirmed glaucoma and in neuro-ophthalmological lesions.

Stato-kinetic dissociation, whereby kinetic stimuli are visible in areas of the field where identical static stimuli are not visible, was demonstrated in occipital lesions by Riddoch (1917). The Riddoch phenomenon has subsequently been shown in optic tract lesions (Zappia et al., 1971), lesions of the optic radiations (Barbur, 1979) and tumours of the anterior optic pathways (Safran and Glaser, 1980).

In a study involving automated, semi-automated and manual perimetry of patients with a wide variety of ocular disorders, Flanagan, Wild, Barnes, Gilmartin, Good and Crews (1984a) suggested that the sensitivity gradient of some patients with retinitis pigmentosa behaved atypically over the dynamic range.

The advent of computer assisted perimetry permitting the rapid assessment of the visual field and the flexibility and ease of control over stimulus variables such as background luminance, target size, presentation time and test strategy, presents the opportunity for more detailed investigations of the earlier findings. Indeed, Barnes, Wild, Flanagan, Good and Crews (1985) using automated and semi-automated perimetry have recently demonstrated the potential for manipulation of the sensitivity gradient in identifying visual field loss.

The aim of the present investigation was to determine whether, in retinitis pigmentosa, additional diagnostic information is provided by varying the dynamic range of the major perimetric stimulus parameters, namely: target size, presentation time and bowl luminance.

**Methods**

The preliminary sample consisted of 10 patients with retinitis pigmentosa displaying varying degrees of visual field loss who were selected from previous hospital records on the criteria of possessing some peripheral residual field. The age of the sample ranged from 22 to 50 years (mean age 41.9; SD 9.3) and comprised 9 males and 1 female. The genetic typing included 5 recessive, 2 isolated, 2 dominant and 1 unknown. Details of scotopic and photopic ERG results and dark adaptation were available for each patient. The eye to be examined was selected on the premise of clearest media, best visual acuity and largest peripheral island of vision.