Contrast sensitivity as a predictor of central field loss.

Extent of central field and contrast sensitivity are strongly related to the ability to perform vision-related activities of daily living, such as reading and driving. An increased understanding of the association between central field loss and other visual measures, as well as how these measures impact performance, will aid vision rehabilitation care. Here, we evaluated the association between extent of central field loss, contrast sensitivity, and visual acuity.

Method

Participants
40 eyes of subjects referred to comprehensive vision rehabilitation at an academic ophthalmology department were assessed for central field loss, contrast sensitivity and visual acuity.

Measures
Contrast sensitivity was assessed using the Pelli Robson chart and logMAR visual acuity was measured with ETDRS chart. Extent of central field loss was evaluated with macular perimetry (OPTON instrumentation). The central 21 degrees of the macula was evaluated using a Goldman III test stimulus presented for 200 ms in a supra-threshold detection paradigm (see Figure 1). Locations that elicited no patient response were defined as scotomatous. Extent of central field loss was calculated as the ratio of scotomatous loci versus non-scotomatous loci. A subset of patients was also tested with the quick Contrast Sensitivity Function Test (qCSF).²

Procedure
Assessment of visual function was obtained as part of usual care during initial vision rehabilitation evaluation. Initial assessment included visual evaluation with manifest refraction, acuity and contrast sensitivity testing, scanning laser ophthalmoscopy macular perimeter, and discussion of rehabilitation plan. Patients were retrospectively selected from the clinic’s patient database.

Results

Figure 2. Correlation between central field loss and contrast sensitivity.

Eyes with fewer scotomatous loci showed lower contrast detection thresholds (i.e. higher contrast sensitivity; M:.16, SD:.24) than eyes with more scotomatous loci (M:.81; SD:.22), t(38)=4.76, p<.00. There was a moderate correlation between extent of visual field loss and contrast sensitivity, r=.51.

Figure 4. Binocular central fields for three patients.

Three patients were tested on three contrast sensitivity measures, the Pelli Robson and VISTECH chart as well as the qCSF test. Their binocular central fields are displayed above. Targets not seen in either eye are displayed as ‘non-seen’.

Figure 5. Contrast sensitivity as a function of spatial frequency measured with Pelli Robson, Vistech and qCSF.

Patients performed tests binocularly. qCSF plots show the CSF with red circles marking incorrect trials, blue circles representing correct trials. Each patient performed 30 trials.

Figure 5 suggests that the three contrast sensitivity measures correlate well.

Patient 1 with the smallest extent of central field loss shows good contrast sensitivity on all measures. Patients 2 and 3 show comparable contrast sensitivity loss. Patient 3 with the greatest extent of central field loss shows the lowest peak sensitivity.

Greater extent of central field loss (as measured with microperimetry) is moderately correlated with poorer Pelli Robson contrast sensitivity. In particular, subjects with normal foveal vision show higher contrast sensitivity in this small series. Future research will investigate how contrast sensitivity characteristics other than peak sensitivity correlate with central field loss. PRL use will be considered. Patterns of central field loss and proximity of field loss to the fovea will be important variables. This research is part of our ongoing effort to increase effectiveness and efficiency of visual function measures routinely used in vision rehabilitation. Please also see Poster 4358/419/A584 by Lesmes et al.

References: