Stability of performance of a handheld radial shape discrimination test in patients at risk of developing neovascular AMD

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Purpose
We aimed to assess the performance of the Handheld Radial Shape Discrimination (hRSD) test longitudinally in patients at risk of developing neovascular age-related macular degeneration (nAMD) prior to disease development.

Methods

The hRSD test
- Run on an Apple iPod Touch
- Stimuli: Radial frequency patterns (sinusoidally modulated circles, frequency ≈ 8 cycles; Fig 1)
- Modulation amplitude controlled by a staircase procedure.
- Spatial 3AF
c- Threshold expressed as a logMAR value.

Participants
- Study eye:
  - no nAMD or central GA
  - VA ≥ 0.4 logMAR
  - no development of nAMD or other sight threatening condition over a period of 5 clinical appointments
- Fellow eye:
  - nAMD, being monitored/treated

Procedures
- hRSD test, using the appropriate near correction?
- Spectralis OCT, assessed at baseline for:
  - Presence/absence of at least one large druse
  - Disruption of the ellipsoid zone (EZ)

Analysis
- Repeated measures ANOVA for the stability of hRSD threshold over time
- Regression analysis and t-tests for the effect of age, VA, large druse, EZ disruption and previous experience with the test on stability.

Results

73 participants performed the hRSD test on 5 consecutive visits over a period of 6.5±1.4 months (mean interval between visits 1.6±0.5 months).

Stability over time
- hRSD thresholds at each visit were not statistically significant different (F1,72=0.368, p=0.53; Fig 2)
- Mean thresholds were consistently below the -0.37 logMAR value suggested for detection of nAMD
- The mean difference in hRSD threshold between the first and the last time points was -0.03 logMAR (Bland-Altman 95% limits of agreement: -0.42 and 0.36 logMAR; Fig 3)
- The mean (SD) slope of all individual (n=73) regression lines (test result on test visit) was -0.0001±0.000962. For an average follow up time of 189±42 days, this slope represented an improvement in hRSD score of 0.03 logMAR over 6.5 months.

Mean thresholds were consistently below the -0.37 logMAR value suggested for detection of nAMD.

Effect of age, VA, large druse, EZ disruption and previous experience on test stability
- the slope of individual regression lines (test result on test visit) was not significantly correlated with age (p=0.99) or baseline VA (p=0.43; Fig 4).

Effect of large druse and EZ disruption on test performance
- large druse and EZ disruption only
- large druse did not have a statistically significant effect on hRSD performance (p=0.3)
- disruption to the EZ did have a statistically significant effect (p=0.03) however the mean difference of 0.07 logMAR was not clinically relevant (Fig 5).

Discussion
Stable test performance over time prior to the development of disease is an important aspect of any test designed to detect the onset of nAMD and the hRSD test appears to meet this requirement.

A number of tests are currently used to monitor patients at risk of developing nAMD. The Amsler Grid is widely used although studies have shown that its sensitivity for detection of nAMD is suboptimal. The Preferential Hyperacuity Perimeter (PHP), which can be used either in clinic or at home, has shown promise although there is a proportion of patients who struggle to produce reliable results on it.

None of our participants reported any difficulties using the hRSD test. This test does not require a specific room luminance and patients can do it using their usual reading glasses and an eye patch. It can also be implemented on relatively inexpensive handheld devices. The hRSD test is therefore very convenient for use both in the clinic and at home.

Conclusions

- hRSD test performance was stable over a period of approximately six months in eyes at risk of developing nAMD
- On average, thresholds remained consistently below the cut-off value for the hRSD test previously suggested to be indicative of disease (≥ -0.37 logMAR).
- No significant effects on performance of older age, worse baseline VA or for patients with large druse or disruption to the EZ

References

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