Using Vision Therapy to Maximize Visual Efficiency for Low Vision Patients with Central Scotoma

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Background

Patients with central scotoma report difficulty with reading and many other activities of daily living.1,2 Central scotoma always results in reduced visual acuity and contrast sensitivity, and frequently also causes limitations in usable field of view.3 Reduced central visual function necessitates the use of eccentric viewing to put both objects and words onto intact peripheral retina.2 Using eccentric retina decreases reading rate because peripheral retina is not as efficient in recognizing words as the fovea, even when print size has been enlarged to compensate for reduced resolution at that eccentric retinal point.4-5 Magnification is often prescribed to compensate for central visual impairment by enlarging the print, but this only partially addresses the patient's functional difficulties. Even with an optimal low vision device, patients with central scotoma often still read slowly6 and have reading difficulties that are due to many factors such as impaired oculomotor control,1,5 poor fixation stability,2,5 reduction of visual span,1,5 and slower temporal processing.1 While some patients easily adopt an eccentric viewing posture, often the majority of patients need to be taught both that the scotoma exists and the most effective way to view it around it.2

The literature discusses three training methods available to help patients with central scotoma to read more efficiently: eccentric viewing training (also can be referred to as preferred retinal locus (PRL) training), eye movement training, and perceptual learning.2,7 There have been reports demonstrating the success of perceptual learning in patients with AMD,1,2-4 and juvenile macular dystrophy.2 Patients with strabismus and amblyopia who eccentrically fixate are taught to view with the macula through vision therapy, and patients with central scotoma can use many of the same vision therapy techniques to learn to view with an eccentric point, develop efficient eye movements, and develop eye-hand coordination for the new eccentric location.5

The following case reports describe how vision therapy techniques typically used to help patients with oculomotor dysfunction were adapted to help a patient with Age-Related Macular Degeneration and a patient with Stargardt's Disease improve their reading eye movements and develop more efficient eccentric viewing.

Case Report 1

LP, a 66 year old white female with AMD was initially seen on 6/14/2011 for a low vision evaluation. Her chief complaint was difficulty reading small print even when her current low vision device. Distance Acuity: 2/12M OD, 2/12M OS, 2/12M OU (ETDRS chart) Near Acuity: 1.0M at 20cm OD and OS, 1.25M at 15cm OU Central visual field: 10 degree central scotoma OD and OS

Therapy goals: Improve distance and near saccades while reinforcing efficient eccentric viewing position and improving eye-hand coordination.

Note: Therapy activities done binocularly and using eccentric viewing

Therapy Sessions 1-3

1. Distance saccades: Hart Chart cut first into corners, then used as 5 columns. LP also had difficulty with fine motor tasks such as putting a key in a lock and pouring liquids.

Distance Acuity: 2/8M OD & EV, 2/6.3M OS (ETDRS chart)
Near Acuity: 1M at 33cm OD, 0.5M at 33cm OS, 0.5M at 33cm OU Central visual field: 10 degree central scotoma OD, 5 degree para-central scotoma OS.

Therapy goals: Improve distance and near saccades while reinforcing efficient eccentric viewing position and improving eye-hand coordination.

Therapy Sessions 4-6

1. Distance saccades: Full Hart Chart used at distance. Hart chart coding added. 2. Near saccades: previous techniques continued but timing added.

Therapy Sessions 7-9

1. All previously stated activities continued but timing added.

VisionBuilder moving window program added.

Case Report 2

CL, a 37 year old black female with Stargardt’s Disease was initially seen on 10/06/2010 for a low vision evaluation. Her chief complaint was difficulty reading small print even with her current low vision device.

Distance Acuity: 1.6M at 20cm OD and OS, 1.25M at 15cm OU

Central visual field: 10 degree central scotoma OD and OS

Therapy goals: Improve distance and near saccades while reinforcing efficient eccentric viewing position and improving eye-hand coordination.

Note: Therapy activities done binocularly and using eccentric viewing

Therapy Sessions 1-3

1. Distance saccades: Enlarged Hart Chart (1.5x) cut into corners and columns. No distance device used.
2. Near saccades: Tracking exercises using numbers, letters, and words. Began with 16pt font and slowly decreased font size as CL improved. 160 handheld magnifier was used.
3. Eye hand coordination activities: Sherman rotator and pegboard rotator, with tactile reinforcement.

Therapy Sessions 4-6

1. Distance saccades: On session 5 began spotting and scanning exercises using 4x12 monocular handheld telescope and standard Hart Chart. Hart chart coding added.
2. Near saccades: previous techniques continued.
3. Perceptual span: CPT Tachistoscope added.
4. Eye hand coordination: Mazes, Pegboard direct copy and pegboard mirror copy added.

Therapy Sessions 7-9

1. All previously stated activities continued but timing added.
2. VisionBuilder moving window program added.

Pre and Post Therapy Comparison

Case 1 - LP

Case 2 - CL

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Discussion

Difficulty with reading is often the main reason that patients seek low vision rehabilitative care.1,2-5 Patients with central scotoma have more difficulty with reading than patients who have reduced central acuity but do not have central visual field defects.6 Those with central scotoma not only have to adapt to reading with the aid of a low vision device, but also have to learn to read efficiently using a new eccentric retinal point.

After 9 sessions, both LP and CL reported subjective improvement in symptoms. LP reported increased comfort with reading and had developed compensatory mechanisms for fine motor tasks. CL reported subjective improvement with reading and spotting. For both patients, objective improvements in reading speed were revealed post-therapy.

These results are in line with the literature which shows that perceptual learning for eye movement control and visual span can increase reading speed in patients with age-related macular degeneration and juvenile macular dystrophy.6-7 A motivated low vision patient will be more likely to achieve success through vision therapy. The process of learning to read using a new eccentric retinal point can be frustrating to the patient and is a time-consuming process.8

Weekly training was recommended for both LP and CL. Before therapy commenced, each patient was educated regarding expectations and the commitment involved. CL was able to commit to weekly training sessions and demonstrated compliance with home activities, which resulted in CL seeing progress from week to week and maintenance of motivation. Due to objective and subjective improvement, additional therapy was not strongly recommended to CL. In contrast, LP demonstrated inconsistent compliance both with attendance and home activities and did not experience the same weekly progress as CL. Additional therapy sessions were recommended to LP but she chose not to pursue this recommendation.

Conclusion

Vision therapy techniques used to train oculomotor skills, strabismus, and amblyopia can be modified to enhance pursuits and saccades, as well as enhance efficient eccentric viewing posture, in patients with central scotoma.

References

10. HTS Inc. 6788 S.Kings Ranch Rd. Suite 4 Golden Canyon, AZ 85118