CASE REPORT

Visual acuity and Contrast sensitivity improvement in a case of Congenital Nystagmus using NeuroVision™ Technology: a Case Report.

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Abstract:

Purpose: To report a case of successful and effective vision improvement in a case of Congenital Nystagmus using NeuroVision™ (RevitalVision LLC) program.

Method: A 12-year-old girl with Congenital Nystagmus was enrolled, treated with NeuroVision™ Perceptual Learning Program. BCVA in the right eye was 20/200 (6/60) and 20/160 (6/48) in the left eye. She enrolled for NeuroVision™ treatment (RevitalVision LLC, KS), a computer-based interface in which a repetitive set of visual exercises is performed for 12 weeks

Results: Following 41 sessions Best Corrected Visual Acuity improved to 20/80 (6/24) in the right eye and to 20/60 (6/18) in the left eye, thus representing 4 lines improvement in each eye. An improvement in Contrast Sensitivity was found in all frequencies as well as a small improvement in stereoacuity.

Conclusions: NeuroVision, a non-surgical perceptual learning technique may be an effective method in improving visual functions in Congenital Nystagmus patients.

1. Introduction:

The term *perceptual learning* describes a process whereby practicing certain visual tasks leads to an improvement in visual performance (Levi & Li 2009). Several studies suggest that perceptual learning occur as a result of modification of neural processes at the primary visual cortex in adults.[1] (Polat 2009) Studies have shown, that perceptual learning with NVC (NeuroVision Correction Technology) can effectively treat adult amblyopia[2],[3] and a recent study demonstrated the efficacy of this technique on amblyopic children 7-8 years old, who failed conventional patching[4]. Other studies have demonstrated the efficacy of NVC on improving unaided vision in low myopic patients[5] and improving unaided vision in presbyopic patients[6] as well as post refractive surgery patients[7] (Tan ARVO 2005). A single study[8] reported significant improvement using NVC for patients with Retinities Pigmentosa, and post intra-stormal corneal ring.

The NeuroVision technology is a non-invasive, patient-specific, perceptual learning program based on visual stimulation and facilitation of neural connections at the cortical level, involving a computerized visual training regimen using Gabor patches, to improve contrast sensitivity and visual acuity.

Congenital Nystagmus (CN) is a rhythmic involuntary oscillatory movement of one or both eyes. It is a neuro-ocular sign of a disorder in the visual sensory or oculomotor system. CN can be considered a disorder of the mechanisms that keeps fixation stable. The pursuit, optokinetic and vestibular system acts to maintain a steady image on the retina. Any lesion that creates an imbalance in this neurologic system can cause nystagmus by making the eyes drift off target.[9]

The plane of oscillation may be horizontal, vertical, torsional or non-specific.
The three main types are:

1. Jerk Nystagmus which is characterized by a slow drift followed by a fast corrective phase. This is usually acquired and indicates brainstem damage.
2. Pendula Nystagmus which is characterized by equal oscillations and either congenital or acquired in the first three years of life.
3. Mixed Nystagmus which is pendulum nystagmus in the primary position and jerk on lateral gaze.[10]

Virtually all nystagmus patients should have aggressive management following a careful diagnosis. It is possible to improve acuity, ocular motor control, cosmesis and visual comfort using sequential considerations of (A) correction of the refractive error with spectacles or contact lenses, (B) prisms to improve fusion, induce convergence and/or reduce a head turn, and (C) vision therapy to Improve fusion capability and enhance stability of fixation. (D) Surgery and (E) medication also have applications in certain cases.[11]

Case Report:
We report a clinical outcome of NVC used to treat a twelve years old patient with congenital nystagmus.

Equipment used to examine the patient:

- Visual Acuity - Snellen VA chart
- Contrast Sensitivity – F.A.C.T Sine Wave distance chart
- Stereopsis – Titmus Fly

<u>Pre treatment baseline examination (August 2010).</u>

Uncorrected vision: OD: 20/400 (6/120) OS: 20/280 (6/72)

Best correction VA:

OD + 4.25/-3.00x20	VA 20/200
OS +3.75/-1.50x165	VA 20/160

Stereoacuity (Titmus) was 60 sec of arc

Contrast Sensitivity Function Test (F.A.C.T Sine Wave distance chart):

OD: A5 B5 C3 D2 E1
OS: A6 B5 C4 D3 E1

	1.5	3	6	12	18
OD	25	40	23	11	4
OS	36	40	33	15	4

Following a full eye examination, the patient went through a guided training session at the low vision center, to insure she can effectively handle and perform the visual tasks.

The initial two NeuroVision treatment sessions involve evaluation of the specific visual abilities, by measuring the threshold level in numerous parameters such as varying size, contrast, location, spatial frequency and orientation, using the Gabor patch.

During the training session the patient sat 1 meter from the screen in a dark room, where the only light source, came from the PC screen.
The patient was instructed to repeat the exercise at home every other day and return for clinical examination after completing 15 sessions.

The patient returned for the first follow up examination following 17 sessions:

Results after 17 sessions (January , 2011):
Best corrected distance VA:
OD: 20/160 OS: 20/80

Stereoacuity was 50 sec of arc

Best Corrected Contrast Sensitivity Test:

	1.5	3	6	12	18
OD	36	57	33	15	4
OS	36	57	23	15	4

The patient reported improvement in seeing at class and watching TV but was still sitting close to the computer and while reading.

Results after 40 sessions (March 2011):
Best corrected distance VA:
OD: 20/80 OS: 20/60

Stereoacuity was 50 sec of arc

Contrast Sensitivity Test:

	1.5	3	6	12	18
OD	50	57	33	15	4
OS	50	80	33	15	6

The patient felt additional improvement

Patient was instructed to continue another 10 session and come for a final examination.

Results

After 40 sessions Visual Acuity improved by 4 lines in each eye (Table 1).
Contrast Sensitivity improved by 64%, 71%, 17%, 15% and 25% for frequencies 1.5, 3, 6,12 and 18 respectively
Stereo improved from 60 sec of arc to 50 sec of arc
No changes were measured in objective or subjective refraction.
The patient reported subjectively on improved vision and improved quality of life. The patient and her parents were highly satisfied with the clinical and functional outcome.

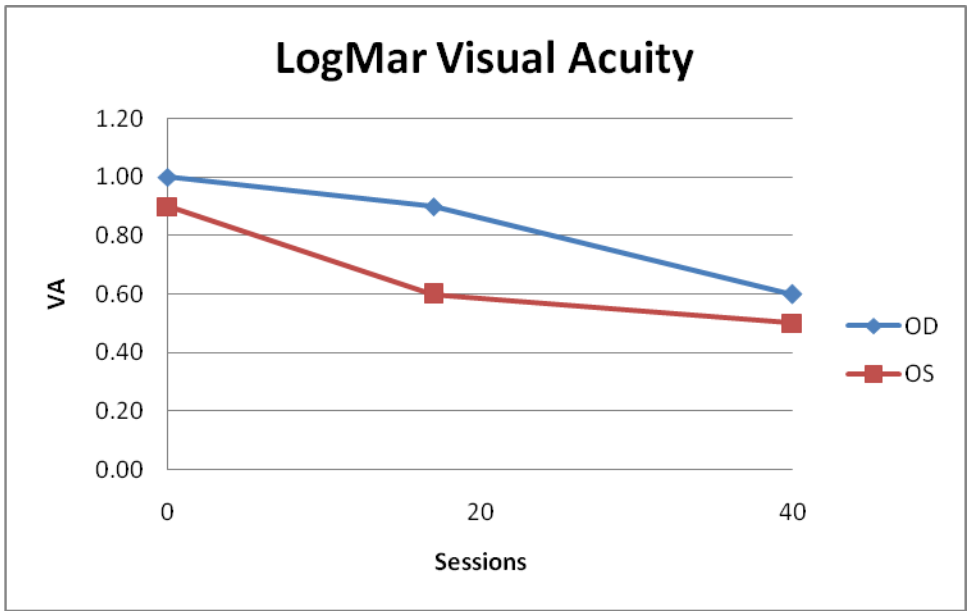
Discussion

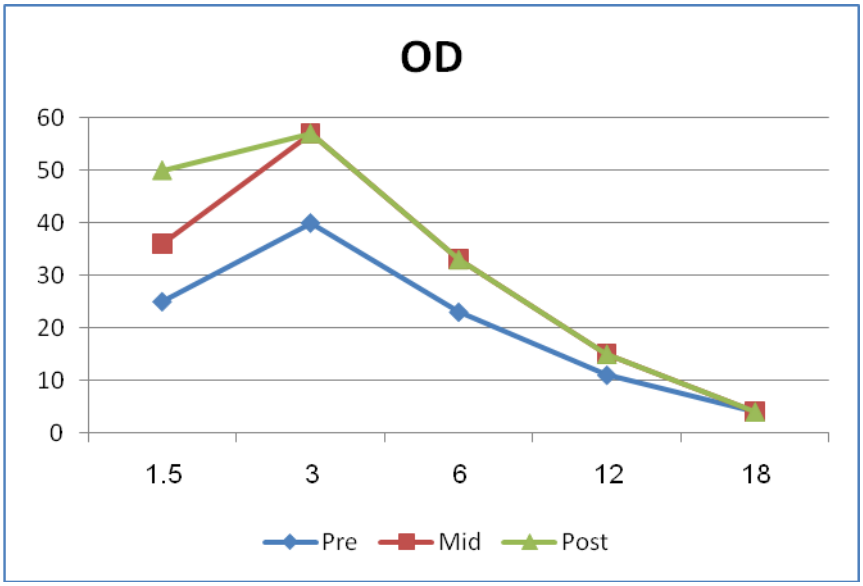
To the best of our knowledge this is the first report to show improvement in Visual Acuity, Contrast Sensitivity and Stereoacuity following Perceptual learning treatment, or any other non-optical method in CN.
Similar to Amblyopia, CN patients lack effective cortical stimulation during the critical early childhood period.
Since NeuroVision was shown to effectively improve vision in adult amblyopia by reducing suppression and inducing facilitations and lateral interactions in cortical activity (Polat et al 2004), it is not unlikely that a similar process occurs in CN. The clinical outcome of this case report suggests that Nystagmus patients may benefit from NVC treatment, which focuses in improving visual processing at the cortex level, and that CN patients can be treated with NVC treatment as in simple bilateral amblyopia

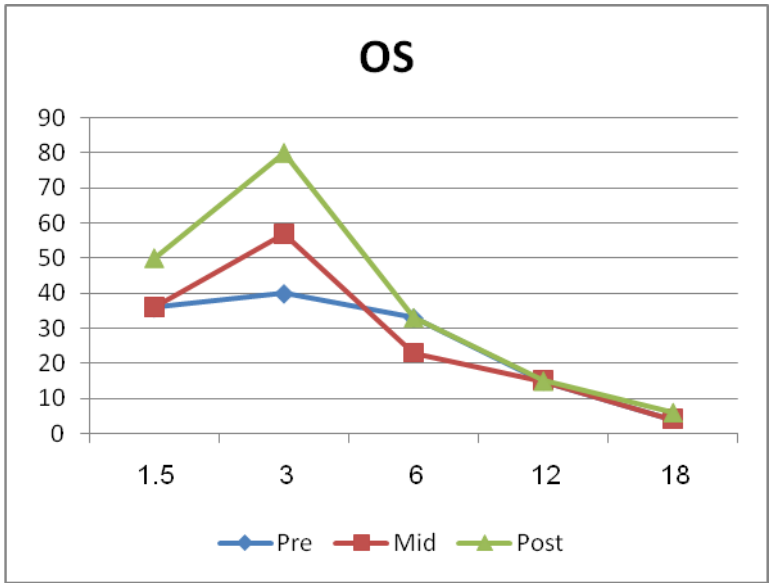
The mechanism by which this treatment enhances vision in CN is not entirely clear. Measurements of eye oscillations were not taken before and after treatement so the effect of treatment on eye movement and retinal image stability is unknown.
After analyzing the model of vision degradation in Nystagmus Beddell (2009) suggested an overlooked secondary amblyopia that maybe present in CN. Whether the reported improvement is as a result of treating such a secondary amblyopia or whether it has a direct effect on the pathophysiology of CN warrants further investigation.
This encouraging outcome should inspire both patients and practitioners to consider this treatment method in such cases, and receive considerable functional improvement in a non invasive approach without any known side-effect.

Tables:

			BCVA LogMar		BCCS OD					BCCS OS				
			OD	OS	1.5	3	6	12	18	1.5	3	6	12	18
1	Pre	0	1.00	0.90	25	40	23	11	4	36	40	33	15	4
2	Mid	17	0.90	0.60	36	57	33	15	4	36	57	23	15	4
3	Post	40	0.60	0.50	50	57	33	15	4	50	80	33	15	6







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