Use of Visual and Auditory Biofeedback Therapy for Infantile Nystagmus on a Pediatric Patient

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Abstract:

Infantile nystagmus is a neurologic condition resulting in involuntary, periodic eye movements. This poster documents a case study using biofeedback training on a pediatric patient as a technique to successfully control and reduce the nystagmus.

I. Case Hx
a. Patient demographics: 10 year old white male
b. Chief Complaint: Mother reports he has had nystagmus since early childhood with no change since onset. He complains of skipping lines when reading and losing his place. Patient reports that large letters appear clear while smaller font seems to blur intermittently. This occurs at distance and near.
c. Ocular history: unremarkable other than nystagmus. No evidence of oculocutaneous albinism.
d. Medical history: Seasonal allergies.
e. Medications: Allegra 180mg tab
f. Other Salient Information:
   ▪ Patient had a psycho-educational evaluation performed, no learning disability.
   ▪ Patient was adopted; there was a vague reported history of prenatal exposure to illicit drugs. Birth weight: 7 pounds.
   ▪ Walked: 1.5 years, talked: delayed
   ▪ Currently he is receiving occupational therapy 2x/week.

II. Pertinent Findings
a. Entering DVA cc: OD 20/60+2 OS 20/50-1, PH NI OD/OS
b. Entering NVA cc: 20/40 OD/OS
c. Manifest Refraction:
   i. OD +1.50-3.50x180
   ii. OS +0.25-2.25x180
d. BCVA: 20/50 OU
e. Phoria: Distance ortho, near 4XP
f. Stereo: RDS 0, Circles 0, Animals 0
g. EOMs:
   i. left beat nystagmus on right gaze
   ii. right beat nystagmus on left gaze
h. Head posture: head tilt right
i. Ishihara color: 6/6 OD/OS
j. Other findings:
   i. Null point in up-gaze, dampens with convergence, amplitude increased when monocular, no oscillopsia
k. Eye Movement Recording
   i. Left jerk nystagmus
   ii. Amplitude: approx 4 degrees
   iii. Frequency: approx 4.5 Hz
l. DFE unremarkable
III. Differential Dx
   a. Primary diagnosis: Infantile nystagmus
   b. Differential diagnoses:
      i. Acquired or pathological forms of nystagmus (dissociated nystagmus, anterior optic pathway lesions)
      ii. See-saw nystagmus
      iii. Spasmus nutans.

IV. Diagnosis and Discussion
   a. Infantile nystagmus is usually observed early in life, usually within the first 3-6 months, manifesting further as the demand for fixation increases.\textsuperscript{1} The nystagmus can manifest with associated ocular disease and/or metabolic dysfunction or abnormalities in the brain. The most common type is infantile idiopathic nystagmus, which has no underlying eye condition or associated neurological problems present.\textsuperscript{2} Infantile nystagmus is a condition that is characterized by bilateral and conjugate eye movements. Other characteristics of the condition include: lack of oscillopsia, presence of a latent component that worsens on fixation, movements that remain horizontal in upgaze, the existence of a null point that is commonly associated with convergence and the absence of an OKN response. The condition is commonly associated with a strong family history; the most common mode of inheritance is due to X-linked mutations.
   b. Case study:
      i. This patient was adopted so his family history cannot be determined.
      ii. The patient's mother first noticed the nystagmus around 2 years of age yet his clinical findings fit within the typical characteristics for infantile nystagmus.

V. Treatment, Management
   a. Based on the evaluations, 6 sessions of biofeedback therapy was recommended to assess response. An additional 16-24 sessions of therapy for continued biofeedback and oculomotor deficiency treatment would then be considered.
   b. Spectacles were updated to provide the patient with optical refractive correction.
   c. Biofeedback and a course of vision therapy were initiated.
      i. Biofeedback training is a technique combining auditory, visual and tactile feedback along with visual attention, visual imagery and relaxation techniques to train oculomotor control.\textsuperscript{3} An improvement in sensory functioning has been seen with oculomotor auditory biofeedback training combined with a multi-sensory training approach\textsuperscript{3}.
      ii. Specifically, therapy consisted of the use of an eye-movement recording device to allow the patient to visualize the amplitude and frequency of their deviation. There was also an associated tone generated related to horizontal eye position. The patient was instructed to use visual imagery and relaxation techniques to invoke higher-level neural control to slow down the movement. The tone provided feedback on the degree of success. The patient was also instructed to physically touch the outer canthus of one of his eyes during the procedure so as to provide tactile feedback. He was educated to pay attention to the level of movement of his eyes and use a grading scale of 1-5, based on both his subjective feelings and the visual and auditory feedback from the eye movement recording and generated tone, to control the movements.
      iii. Biofeedback was started at the patient's first therapy session and occurred for the first 10 minutes of every session throughout the entire course of therapy. Using the visual, auditory and tactile stimuli as well as visualization techniques, by the end of therapy, the patient was able to consciously know what “level” his eyes were at not only during therapy but throughout the day. He was conscious of
when he was losing control and he was able to use the techniques learned during therapy to bring his ocular movement back under his control.

d. After 10 sessions of biofeedback and traditional oculomotor therapy, the patient was fitted with RGP lenses; these provided an added level of tactile sensory feedback via the sensation of the lenses during the blink.

e. At the end of therapy, the patient was re-evaluated with a VA of 20/40 OU and he was able to achieve a positive result on RDS and Wirt Circle testing. The amplitude was reduced to 1.5 degrees; frequency was reduced to 3 Hz.

VI. Conclusion

a. Auditory and visual biofeedback therapy is a training technique that can successfully reduce the amplitude and frequency of congenital/infantile nystagmus in a pediatric population.

b. This technique provides patients with techniques and skills that can be used not only during therapy sessions but that also translate into real-world situations. For the pediatric population, this includes an academic setting and often enhances performance during reading and performing visually demanding activities. Improved cosmesis when interacting with peers is also a favorable outcome.

Citations: