



Vision Therapy Management of Cranial Nerve VI Palsy

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Abstract

Cranial nerve VI palsy is characterized by the inability of the eye to abduct. It is usually caused by tumors, trauma, or inflammation. There are various treatment modalities in the literature such as surgery and botulinus toxin injection. However, this case report will demonstrate optometric management of CN VI palsy with vision therapy.

Case Summary

History: CS is a 28 y.o female optometry student that presented to The Eye Center because she reports diplopia while learning biomicroscopy and binocular indirect ophthalmoscope, BIO. Her ocular history is remarkable for left cranial nerve VI (CN VI) palsy from birth trauma secondary to forceps delivery. Subsequently, she has a left head turn to reduce the diplopia. **Findings:** Corrected visual acuity was 20/15 OD, 20/15 OS 20/15 OU at 6m and 20/15 OD, 20/20 OS, 20/15 OU at near. EOMs were remarkable for abduction restriction OS and gaze evoked nystagmus in left gaze. Cover test: 40pd CLET at 6m and 20pd CLET at 40cm. NPC: 3/7cm x3. Stereopsis was 30sec of arc with right head turn. Angle of fusion with vision disk was 20 degrees to the right in primary gaze. Refraction was -2.50DS OD and OS. Anterior and posterior segment was unremarkable. **Diagnosis:** 1. Cranial Nerve VI Palsy, acquired. 2. Myopia. **Treatment:** 1. Begin in office vision therapy to increase fusion ranges 2. Continue contact lens wear. Ten weeks of vision therapy was divided into the general categories of ocular motility, accommodation, and fusion in free space and in instrument. **Results:** Subjectively, CS noted improvement in her ability to diverge and she didn't notice diplopia in the biomicroscope or with the BIO. Her stereopsis, range of fusion, and oculomotility improved.

Discussion

Although vision therapy is not a cure, it is a highly useful treatment modality for enhancing the visual skills and quality of life of patients with CN VI palsy.

Background

Abducens nerve palsy is the most common ocular paresis.¹ The most prominent symptom is horizontal diplopia which increases when looking at distance objects as the images are uncrossed. In most cases there is characteristic head turn towards the side of the defect. Cranial nerve six palsies can be secondary to an assortment of etiologies such as vascular, viral illness, inflammation, trauma, and undetermined.^{1,2} In acquired cases, it is important to rule out malignant causes such as tumors or vascular etiologies. Patients with congenital sixth nerve palsies will have a long standing history of a head turn towards the side of the lesion. Management for this includes Botox, prism, and patching.³ There are few cases in the literature that uses vision therapy as an option for treatment.⁴⁻⁶ This poster will present a case of congenital abducens nerve palsy managed with vision therapy.

Case Data

CS is a 27 year-old female that presented to The Eye Center with complaints of horizontal diplopia in primary gaze specifically while practicing through a biomicroscope and binocular indirect ophthalmoscope. She is a second year optometry student and she noted that the diplopia was difficult to tolerate while trying to discern retinal findings in her lab courses. Medical history was remarkable for asthma. Ocular history was remarkable with left abducens nerve palsy from birth. CS stated that she was told it was due to birth trauma

from being delivered via forceps. She also noted that she has had a left head turn as long as she could remember. (See Figures 1 and 2)

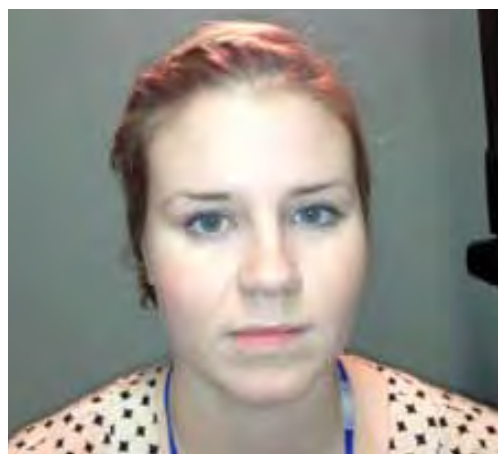


Figure 1: Primary Gaze

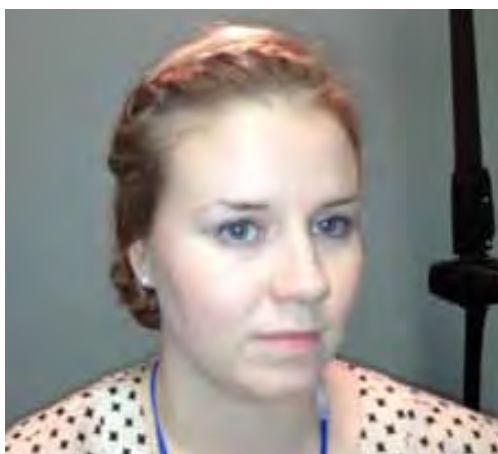


Figure 2: Usual head turn to left

Examination Findings: Initial visit

- Visual acuity was 20/15 OD, OS, OU in the distance and 20/20 OD, OS, OU at near with correction
- EOMS: left abduction defect in the left eye. Diplopia noted in all gazes except for Right superior, right temporal and right inferior.
- Cover Test: in the Distance 40pd CLET; at 40cm 20pd CLET
- Stereopsis: Positive response with random dot forms, 30 seconds of arc with head turn to the left
- Pupils: PERRLA - APD
- Refraction: -2.50 DS OU
- MEM with correction: +0.50
- NPC 4/6cm x3
- Vision disk angle of fusion: from primary gaze 20 degrees to the right she noted single vision
- Accommodative amplitude was 10 D OD, OS
- Step vergence ranges at near: BI x/10/2 BO 14/30/20
- Anterior and Posterior segment was unremarkable.
- Talk about Fresnel prism

Assessment: 1. Cranial nerve VI palsy secondary to birth trauma OS
2. Simple Myopia

- Plan:**
1. Remove contact lenses, use glasses to begin wearing 25pd Fresnel prism for palliative relief of diplopia, enroll in Vision therapy to increase fusional ranges
 2. Continue with current Rx

Examination Findings: Follow-up Visit

CS notes that she is able to fuse in BIO with the 25 PD Fresnel BO but when she pulls slit lamp back to perform a 78D or 90D fundus examination she is double.

- Visual Acuity: D 20/20 OD, OS, OU; at N 20/20 OD, OS, OU
- Stereopsis: 30 seconds of arc, (+) forms
- NPC 3/7cm x 3
- CT: D 8pd CLET, N 14pd CLET
- Vision disk angle of fusion: from primary gaze 13 degrees to the right, she noted single vision

Assessment: 1. CN 6 palsy

- Plan:**
1. Remove Fresnel prism, enroll in VT

Vision Therapy consisted of 11 weekly sessions with the primary goal of reducing diplopia in the biomicroscope and binocular indirect. There were three core areas we wanted to address in therapy: optimize oculomotility, enhance accommodation, and build up vergence fusion in primary gaze.

Table 1 : Vision Therapy Sessions

SESSION 1-3	GOALS
Eye control	Ocular calisthenics
Sanet Visual Integrator	Saccades, pursuits, fixations
Brock String	Fusion
SESSIONS 4-6	GOALS
Eye control	Ocular calisthenics
Central-peripheral saccades	Peripheral fusion
Quoits (peripheral and instrument)	Peripheral fusion, awareness
Eccentric circles	Fusion with varying vergence demands in different gazes
See 3 coins	Fusion in primary gaze
SESSIONS 7-11	GOALS
Visacare divergence and convergence cards	Fusion in instrument
Brock string with +/- flippers	Fusion in different gazes with accommodation varied
Vectogram BOP/BIM	Fusion with varying accommodation and vergence demands
Aperture Rule	Fusion
Cheirosopic tracings	In instrument fusion

Examination Findings: Follow-up visit

CS reports that she doesn't see double in the slit lamp anymore. Sometimes she needs to dial in about 10PD but she can fuse for the most part. She still turns her head to the left, but she feels that she doesn't have to turn it as much and she is able to relax her focusing to aid fusion when doing slit lamp. It was noted during her last three therapy sessions that she could fuse the Brock string and Quoits divergence demands better with the plus side of the flippers.

- Visual Acuity with correction: D 20/15 OD, OS, OU; at near 20/15 OD, 20/20 OS, 20/15 OU
- EOMS: left abduction defect in the left eye. Diplopia noted in all gazes except for Right superior, right temporal and right inferior.
- Cover test: D 40pd CLET, N 20pd CLET
- Stereopsis: 20 sec of arc, (+) forms, with +1.00D OU, she noted that stereopsis was easier to perform and she turned her head to the left less.
- Vergence Ranges: N BI x/8/6 BO 60/65/60
- MEM: OD: +0.75 OD, +0.50 OS MEM with +0.75 OU: plano OU
- Vision disk angle of fusion: from primary gaze, 6 degrees to the right she noted single vision!
- Stress point retinoscopy*: +1.75D

*performed by Dr. Paul Harris

Assessment: 1. CN 6 Palsy

- Plan:**
1. Rx +1.00 for near to enhance fusional comfort, continue with maintenance therapy of Brock string with flippers and eccentric circles. RTC as needed

Discussion

This case report demonstrates the effectiveness of vision therapy to enhance the quality of life of a patient with cranial nerve VI palsy secondary to birth trauma. Although Fresnel prisms are useful in some cases, it wasn't the ideal modality of treatment. Vision therapy improved the patient's range of fusion and thus significantly reduced the incidence of diplopia in an instrument. Also, it seemed that although the patient's lag of accommodation wasn't within acceptable ranges when plus was added at near, her subjective responses and the stress point therapy all pointed to a near prescription to aid in divergence and fusion at near.

When considering vision therapy for patients with a benign abducens palsy, eye care professionals should consider the following in a vision therapy program besides oculomotor, accommodation and vergence therapy: ocular calisthenics to reduce any contractures and restore the greatest possible function in the paretic muscle, start where the eyes are mostly aligned and slowly move to where they are not aligned to increase fusional ranges, (See Figures 3 and 4), and incorporate large peripheral targets such as Quoits, projected then at near to enhance binocularity.⁷⁻⁸ Lastly, utilize peripheral awareness techniques to solidify fusion gains in therapy.⁸ (See Table 2.) Although Vision therapy is not a cure, it is a valuable treatment modality to positively affect the quality of life for our patients with benign cranial nerve VI palsy.



Figure 3: Patient performing brock string where eyes are aligned, not in primary gaze



Figure 4: Patient performing Quoits where eyes are aligned.

Table 2. Vision therapy considerations for benign CN VI palsy

VISION THERAPY GUIDE	
1. Ocular calisthenics	3. Utilize large peripheral targets
2. Start where eyes are aligned	4. Enhance peripheral awareness

References

1. Leigh JR, Zee DS. Neurology of eye movements, 4 ed. New York, NY: Oxford University Press, 2006.
2. Holmes JM, Srinivas M, Maus TL, Grill R, Hodge DO, Gray DT. Pediatric third, fourth and sixth nerve palsies: a population based study. Am J Ophthalmol 1999;127:388-392. J Pediatr Ophthalmol Strab 1994;3:79-83.
3. Repka MX, Lam CC, Morrison NA. The efficacy of botulinum neurotoxin A for the treatment of complete and partially recovered chronic sixth nerve palsy.
4. Cooper J, Cluffreda KJ, Carniglia PE, Zinn KM, Tannen B. Orthoptic treatment and eye movement recordings in Guillian Barre syndrome: a case report. Neuro-ophthal 1995;15:249-256.
5. Vicci VR. Fourth cranial nerve palsy: A case study. J Low Vis 1997;11:4-6.
6. Cohen AH. Optometric management of binocular dysfunctions secondary to head trauma: case reports. J Am Optom Assoc 1991;63:569-575.
7. Griffin JR. Binocular anomalies, procedures for vision therapy, 2nd ed. Chicago: Professional Press, 1982.
8. Cook DL. Optometric management of patients with incomitant strabismus. J Behav Optom 2004;15:10-16

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