Adult-Onset Esotropia: Triage and management

STATE UNIVERSITY OF NEW YORK
COLLEGE OF OPTOMETRY

Audra Steiner, O.D., FCOVD
Associate Clinical Professor, Vision Therapy and Rehabilitation

INTRODUCTION

Strabismus is a challenging condition to manage in general, but some cases present more difficulties than others. Childhood esotropia is generally essential, though exceptions to this rule exist. When an adult presents with esotropia, the need to untangle the timing of onset, tease out causative factors, determine the need for additional referrals, devise a treatment plan, and manage patient expectations can be a daunting precipice to conquer.

ESOTROPIA IN ADULTS

Prevalence

Some adults have strabismus that was congenital or early-onset, and others have acquired deviations. Life events and acquired health issues can cause new-onset strabismus. Some adults have had a longstanding high phoria or intermittent strabismus, which, though well-compensated for in their younger days, becomes manifest over time, especially near the onset of presbyopia. A National Health Survey found prevalence of children of children ages 1-3 years (1.9%) was lower than in patients ages 4-54 years (3.3%) than in patients over the age of 55 (6.1%.)[1] Whereas esotropia is more prevalent than exotropia[2] in children, in adults the reverse is true[1].

Precipitating factors

Adult-onset esotropia can be associated with

- Decompensation of an existing phoria
- Sensory disruption, as with a cataract or macular degeneration
- Swelling of the intraocular muscles, as in thyroid eye disease[3]
- Compression of the extraocular muscle cone with globe elongation in high myopia
- Tumors and other causes of increased intracranial pressure
- Anereurysms and strokes
- Small vessel disease as causes by diabetes, blood dyscrasias, or hyperlipidoses[4]
- Injuries that entrap extraocular muscles
- Neurologic diseases such as Parkinson's, myastheria gravis, or multiple sclerosis
- Brainstem insult, as in Arnold-Chiari malformation

Because some causes of adult-onset esotropia signal significant underlying threats to health, it is of the utmost importance to be comfortable in quickly assessing the nature of the strabismus, gauging how long the deviation has been present, and understanding whether and to whom referral for additional evaluation should be made. Routine optometric testing can reveal much about the urgency of a new-onset esotropia. Localization of a potential lesion or health anomaly streamlines referral and ordering of imaging and blood work.

	Visual acuities	EOMs	Pupils	NPC	Color Vision	Stereo acuity	Visual fields	Corres-pondence	Fundus Exam
Ocular Health									
Optic Nerve Disease									
↑ CSF Pressure									
Neurologic Disease									
Vascular									
Duration of issue									

Patient age is also an important consideration. Diagnosis of a non-traumatic sixth nerve palsy in patients under 50 years of age is likely to indicate a tumor (33% of patients) or multiple sclerosis (24% of patients)[4]. In older patients, the same nerve palsy is often attributable to serious but less urgent vascular changes related to diabetes, hypertension, or hypercholesteremia. (50% of patients.) Recurrent nerve palsies in patients of any age warrant further evaluation.

Never assume primary care physicians will automatically know what testing to order based on optometric exam findings. Nearly all will be appreciative of a brief, descriptive note with suggestions as to the right next steps to take. Radiologists, too, prefer at least an indication of the presenting complaint, the area of suspicion, that what kind of scan you are requesting.

Having ruled out urgencies, treatment options include "tincture of time", prism, occlusion, vision therapy, and surgery. Choice the treatment is guided by patient needs and causative factors.

CASE SUMMARY

"Violet" a 66 year-old Asian-American woman, presented with concerns about a slowly progressive and increasingly cosmetically noticeable esotropia with diplopia. She has been a patient of the SUNY College of Optometry's University Eye Center since October 2010. Violet had been prescribed prism for left fourth nerve palsy that first presented after she underwent chemotherapy for breast cancer 15 years previously. Motor function had improved significantly over time, and her vertical diplopia had improved. Violet's health history otherwise was unremarkable. Her optometric history was significant for high myopia, dry eye, and use of monovision RGP contact lenses. Violet had been followed in our contact lens clinic since 2006 and had been seen for consult in our Neuro-optometry service. Below is a summary of her pertinent exam information leading up to her vision therapy evaluation.

Date	Reason for visit	Outcome
10/2006 First Clinic visit	Reports occasional diplopia and having prism glasses for over contacts, but prescription was not recorded the chart. Happy with monovision RGP modality.	No binocular testing was recorded Received updated monovision RGPs. Advised to continue use of current prism glasses. Initial spectacle prescription: OD -7.75-0.75x105 OS -8.00-0.25x085
11/2006-6/2007	Several contact lens follow-up appointments. Diplopia complaint increases at 6/2007 exam. No binocular testing.	At last exam in this period, Violet is referred to SUNY's neuro clinic to assess double vision and reassess prism.
7/2007	Neuro Clinic eval case history reveals that diplopia is diagonal, worse at far than near, and that Violet had done some vision therapy with a local doctor, but discontinued services because she was too busy. She was 9^ esophoric at distance, 6^ esophoric at near, with a consistent 3^ left hyper.	Records from her oncologist and neuro-ophthalmologist indicated they had ruled out myasthenia gravis and metastasis of her breast cancer. Updated prism glasses of 1^ base-up OD and 1^ base-down OU were prescribed. Follow-up in 3 months was recommended, but that appointment was not kept.
5/2009	Comprehensive eye exam: increasing double vision, unsure whether vertical or horizontal, worse at far than near, similar with glasses and contact lenses. Cover testing : 8^ left esotropia/4^ left hypertropia at distance and 16^ left esotropia/4^ left hypertropia at near	Monovision lenses discontinued in favor of distance-only lenses. Achieved good clarity of vision with add, but satisfactory prism could not be found for comfortable fusion. Referral made to SUNY neuro clinic.
6/2009-4/2010	Neuro appointment was not kept. Patient had seen her oncologist and had received a good report.	Near glasses incorporating vertical relieving prism were prescribed at a contact lens follow-up.
5/2010	Patient would like to be re-fit in monovision RGP lenses.	Patient refit into monovision. No mention of diplopia was made at this visit. No binocular testing.
6/2010-6/2015	Contact lens follow-up: diplopia stable , vision at far slightly blurry. Using OTC near readers, prism glasses broken.	Updated monovision contact lens and near prism glasses prescribed. No binocular testing performed.
3/2016	Comprehensive eye exam: dizziness and diplopia have increased, patient feels uncomfortable walking outdoors. Thinks her eyes might look crossed. With monovision contact lenses, 30-40^ constant, alternating esotropia noted.	Pupils normal. EOMs not noted. No referrals made, as patient says the double vision is "livable." Spectacle prescription: OD -9.25-0.75x075 OS -9.50-0.50x080
10/2016	Request from contact lens doctor asking for help scheduling Violet in for a vision therapy evaluation.	Explained to her that she does have insurance coverage for vision therapy and scheduled evaluation.

VISION THERAPY EVALUATION: 11/2016

Violet truly presented as a timid, shrinking violet. She was very concerned about mostly horizontal double vision and a cosmetically noticeable alternating esotropia. She was often dizzy and felt ungrounded and as though her depth perception was off. Walking through the city and navigating subway stairs made her very anxious. She had been in close contact with her oncologist, who assured her she did not have metastatic cancer or neurologic disease. Her overall health was excellent. Visual fields were full per confrontations.

Vision Therapy Exam Findings

Visual Acuity with Monovision RGPs			Distance OD	20/20-3	Near OD 20/40-2
Violet also had habitual bifocal, non-prism glasses and PALs with vertical prism over-glasses to give balanced distance vision with monovision RPGs			Distance OD	20/40-1	Near OS 20/20-2
			Distance OU	20/20-3	Near OU 20/20-3
Note: correctable to 20/20- at near and far with PAL spectacles and CL over-refraction					
Confrontation fields: Full OD and OS			Red cap test: saturation equal OD and OS		
Cover test, monovision RGPs	Distance and Near	35^ CAET OS fixation 70% of time 4^ left hyper	Cover test, BCVA spectacles	Distance and Near	30^ CAET OS fixation 70% of time 4^ left hyper
Stereopsis, habitual	(-) random dot (-) Wirt				
Stereopsis, 25^ BO	(+) 250" random dot (+) 40" Wirt				
Cranial nerve screening	EOMS (CN 3, 4, 6)	No restrictions in EOMs			
	Pupils	PERRL (-)APD, brisk responses			
	Trigeminal (CN 5)	Facial sensation equal bilaterally; equal masseter function			
	Facial (CN 7)	No asymmetry to smile, lid closure to brow elevation			
	Vestibulocochlear (CN 8)	Roughly equal sensitivity to soft sounds for each ear			
	Glossopharyngeal (CN9)	Voice smooth, neither hoarse nor nasal; no uvular displacement			
	Hypoglossal (CN 12)	On tongue protrusion, no deviation to either side			
Worth Four Dot, Prism to flat fusion	Distance	25^ base out	Prism Evaluation	Initial trial frame indicted best subjective comfort and balance with 25^ BO over right eye. Fresnel prism demonstrated as well.	
	Intermediate	25^ base out			
	Near	25^ base out			

Vision Therapy Exam Plan and Re-evaluations

Visit	History	Findings	Plan
Plan			Violet was quite fatigued by the end of the evaluation. At her follow-up 2 days later, she was found to have normal correspondence. Final prism testing was performed. With 25^ base-out Fresnel over her right eye applied to her over-RGP progressive/vertical prism glasses she noted relief of her diplopia and a better feeling of balance. Violet was taught thumb rotations, use of a Brock string, and use of red-green acetate sheets, left uncut, to be placed over her computer monitor or a window. Violet was added to the wait list for strabismus therapy. Though we did discuss it as a possible option, Violet had no interest in a surgical consult.
5-week re-eval	Violet still noted her eye turn and diplopia, though she thought it might be a little better at near. She reported good adherence to home activities	Range of fusion on the Brock string from 10" out to about 50" with prism in place. Her ability to see simultaneously through red and green acetate sheets has similarly improved. Cover test through monovision RPGs found 25^CAET distance and near.	Violet felt the prism was a bit strong. Reduction to 20^ base-out was more comfortable. We reviewed her home exercises and encouraged her to keep up the good work. She was still waiting for an appointment for vision therapy.
9-week re-eval	Violet happily reported significant reduction in diplopia with the prism. She had experimented with taking her over-glasses off intermittently during the day. Diplopia was initially bothersome but became "livable" again after about 30 minutes.	With the prism in place violet's range of fusion on Brock string was from about 72" to 4" with solid convergence and divergence ranges at far and near. Cover test with monovision RGPs found a 15^ CAET. Brock string fusional range with RGPs was 3" to 20".	Fresnel was updated to 15^ BO. Violet deferred prescription of ground-in prism, preferring use and remove her over-glasses as needed. She asked up to keep her on the list for vision therapy, though she allowed she was feeling better and might not do VT.
Recently	An appointment that worked with Violet's schedule was available, but she deferred, saying she was happy with her progress. I asked her to consider letting us write a prescription for ground-in prism, and she said she would "think about it." Violet's demeanor had changed substantially from her initial evaluation. She was bubbly and mentioned that, while going about her day, she almost never through about her eyes.		

MAKING THE DOCTOR COMFORTABLE

I had the luxury in this case of a patient who was in close contact with her oncologist. Violet's deviation appeared to be comitant. She had normal correspondence, indicating that this was a new-onset deviation, but no obvious cranial nerve dysfunction. Violet's fields were full to confrontation, and her ocular health was normal, helping ease my fears of a space-occupying lesion. Her myopia had increased over time, possibly compressing her muscle cone. She had one reference to an esophoria in her records. Any form of monocular image degradation, monovision contacts included, can destabilize fragile fusion.

MAKING THE PATIENT COMFORTABLE

Violet was interesting in having a high tolerance for diplopia and a relatively philosophical outlook on life. She was accepting though her experiences with monovision that one might make compromises to perfect vision to be comfortable. She waited until she was significantly disequilibrated before seeking help. Her primary concern initially was whether the appointments would be covered by her insurance. Whereas I would have wanted more aggressive treatment to reduce her prism and restore better binocular skills, she was happy for a significant reduction in diplopia and the security of her back-up Fresnel glasses.

A CAREFUL CALM

Remember that not all "recent-onset" issues are recent. Patients have sometimes had a strabismus that has gone unnoticed for years. A finding of anomalous correspondence strongly indicates that this is the case. Your basic test battery is a powerful health screener. Lacking a cortical insult, most patients who have normal correspondence will be able to regain binocularity[5]. Clear communication of your sense of urgency is critical in compliance with any additional testing. Optometrists are well-situated as gatekeeper providers and educators to patients presenting with all manner of functionally and cosmetically unsettling visual conditions.

REFERENCES

1. Roberts J, Rowland M. Refractive status and motility defects of persons 4-74 years, United States 1971-1972. Vital and health statistics: series 11, DHEW publication no. (PHS) 78-1654. Hyattsville, MD: National Center for Health Statistics, 1978.
2. Ursula M. Donnelly MRCOphth, Nuala M. Stewart DBO & Mina Hollinger. FRCPCH (2005) Prevalence and Outcomes of Childhood Visual Disorders, *Ophthalmic Epidemiology*, 12:4, 243-250.
3. Erin O; Wallace, David K. Schotthoefer, Strabismus associated with thyroid eye disease. *Current Opinion in Ophthalmology.* 18(5):361-365, September 2007
4. Peters GB III, Bakri SJ, and Krohel GB. Cause and prognosis of nontraumatic sixth nerve palsies in young adults. *Ophthalmology,* 109: 10 (2002), pp. 1925–1928.
5. Bridge H. Effects of cortical damage on binocular depth perception. *Phil. Trans. R. Soc.* B 371: 20150254, 2016.

Thank you to Israel Greenwald, OD, FCOVD, for helping me understand when it's not time to panic, and to Pat Modica, OD, FAAO, for showing me when it is.