TREATMENT APPROACHES TO: DIVERGENCE EXCESS INTERMITTENT EXOTROPIA

Intermittent exotropia is one of the most commonly encountered varieties of strabismus. Treatment is successful in approximately 90% of cases presenting for optometric vision therapy, according to well-documented studies using rigorous criteria.1-5 In this Viewpoints feature two authorities on divergence excess/intermittent exotropia describe their treatment approaches. Dr. Jeffrey Cooper, Clinical Professor at the State University of New York College of Optometry, has researched and published extensively on the subject. Dr. Nathan Flax, Professor Emeritus at SUNY College of Optometry and recipient of COVD's G.N. Getman and A.M. Skeffington awards, has published and lectured widely on optometric management of intermittent exotropia.

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MANAGEMENT OF DIVERGENCE EXCESS INTERMITTENT EXOTROPIA

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Abstract

A method of treating divergence excess intermittent exotropia which differs from standard orthoptics is presented. Training is not done at the objective angle; ARC is ignored; diplopia awareness is not cultivated; stereoscopic targets are introduced before flat fusion or simultaneous perception targets; little emphasis is placed on developing base-out prism vergence ranges; monocular skills and accommodative facility are developed; and plus adds are utilized. The rationale for this approach is developed.

Key Words

exotropia, divergence excess, strabismus, orthoptics, vision therapy

For more than 30 years, I have been treating divergence excess intermittent exotropia in a highly successful way which produces excellent long-term control.[1,2] This approach differs from other methods in the following ways:

1. No attempt is made to make the patient aware of diplopia.
2. Training is not done at the angle of squint.
3. Anomalous retinal correspondence (ARC) is ignored.
4. Stereoscopic targets are utilized first, followed by second degree targets. Simultaneous perception targets are utilized last.
5. Relatively little emphasis is placed on increasing base-out prism vergence ability.
6. Monocular skills and accommodative facility are emphasized.
7. Near plus in bifocal form is utilized for long-term control.

The goal of my treatment is to achieve alignment without conscious effort by developing a postural vergence set for straight eyes. A basic premise of my approach is that tonic vergence, rather than fusional vergence to avoid diplopia, is the primary mechanism by which normal individuals maintain straight eyes. This differs from standard orthoptic methods which emphasize diplopia awareness and development of fusional vergence to overcome latent strabismus.[3,4] Diplopia awareness has little place in normal seeing. While it can be used as a tool to trigger fusion, this is not natural. Brock stated: "If the norm for any behavioral characteristic is determined by its frequency of occurrence, then it must be conceded that the awareness of physiologic diplopia is an entirely abnormal experience: ... The fact that you can 'teach' them to see double in a matter of minutes does not alter this fact."[5]

Continued on page 72

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Continued from page 66

Intermittent exotropes of the divergence excess type usually can demonstrate fusion, including high level stereopsis before therapy is initiated. Their binocular vision is closer to that of normals than to constant strabismics since they can demonstrate sensory fusion and bifoveal motor alignment at the same time, a condition that constant strabismics cannot meet. Their problem is not lack of sensory fusion, but rather an inability to maintain alignment on a consistent basis. My approach emphasizes reinforcement of straight eye posture rather than elimination of suppression or ARC when the eyes are turned. Suppression and ARC are considered to be adaptations that will fade when they are no longer useful to the patient. If the turn is intermittent, it is not even necessary to test for ARC. A guiding principle is that the sensory status when deviated becomes moot if the deviation itself is eliminated by developing tonic postural vergence. Training at the angle of turn is avoided and the problem of ARC is finessed. If present, ARC disappears as the patient gains motor control over the deviation.

My training regimen reverses the usual order of presentation of binocular stimuli. The usual schema of classifying fusion stimuli as first degree simultaneous binocular awareness, second degree flat fusion, and third degree stereopsis implies a hierarchical relationship which does not exist in the real world. Simultaneous awareness of dissimilar foveally viewed targets is not encountered under normal circumstances. It can occur only if the patient is strabismic or if a carefully structured artificial environment is created by use of a stereoscope, vectographs, anaglyphs, or a distorting device such as a Maddox rod. First degree binocular awareness is not likely to be a stage in the development of normal binocular vision. Flat fusion is also rarely encountered in the real world. There are almost no conditions in which the two eyes do not receive disparity cues. Even when looking at a flat page or CRT screen, the overall scene contains stereoscopic cues. Almost all natural stimulus conditions are essentially stereosacopic. It requires special manipulation of the visual inputs to achieve flat fusion.

Intermittent exotropes are unconsciously selective in the manner in which they utilize binocular vision, aligning the eyes when binocular cues are useful and allowing an eye to deviate when there is little benefit from binocular vision. The turn often occurs when "daydreaming." Parents of young children note that the child's eyes straighten whenever there is attention to the task at hand. For those patients whose turn is present at near as well as at distance, the push-up nearpoint of convergence may be receded. However, when the same target is utilized with instructions to localize it (as in the stick in straw test), convergence improves. These patients find it easiest to fuse stereoscopic targets. They find it more difficult to fuse and maintain alignment when there is no intrinsic benefit to binocular vision. This is the reason for my reversal of the standard order of presentation of stimuli. I begin with stereoscopic targets and gradually introduce second degree and finally simultaneous perception targets. The goal of treatment is to have the patient maintain straight eyes even when stereopsis is not useful or available.

Since the goal of treatment is to develop a postural set for straight eyes, no activities are done which would reward or reinforce the patient when the eyes are in the deviated position. Training is not done at the angle of turn. Binocular activities are introduced at the ortho setting utilizing stereoscopic targets since these are more likely to permit the patient to hold alignment. Straight eye posture is rewarded and the stimuli are gradually modified from stereoscopic to second degree to simultaneous perception with continual emphasis on holding posture. When the patient cannot hold alignment, the activity is modified by providing a stronger stimulus to fusion rather than calling attention to diplopia. Quality of fusion is emphasized, including attention to spatial localization and SILO when using vectographic and anaglyphic targets. Peripheral stereopsis using projected targets is the usual starting point of binocular treatment. Most of the early binocular training does not involve closed stereoscope or amblyoscope procedures because the patient usually cannot succeed in fusing at ortho in these instruments. Closed instrument tasks are introduced when the patient can perform at ortho. Third degree targets are used initially and then followed by second de-

It is generally not necessary to emphasize development of base-out vergence ranges since fusional convergence tends to restore spontaneously as the patient responds to the treatment approach. The notion of increasing fusional convergence assumes that the fundamental problem is structural exophoria. My approach is based on a different premise regarding the etiology of divergence excess. Early in my career I noted inconsistencies in the behavior of many divergence excess patients which could not be reconciled with a standard graphical analysis model of binocular vision. The positive relative accommodation-negative relative accommodation (PRA-NRA) relationship often was at variance with what might be expected for an exophore, with the negative relative amplitude high and the positive relative amplitude low. Some showed near esophoria which was not consistent with the distance deviation. During treatment, the near lateral phoria of some patients changed abruptly in the direction of esophoria despite the fact that the treatment had not been heavily involved with development of near convergence. The blur, break, and recovery of the prism vergence measurements were not always consistent, nor did they respond to treatment in the same way.

These behaviors are not readily explained by graphical analysis, but they are by the OEP-Skeffington model.[6] The B case type of Skeffington and divergence excess bear striking similarities.[7] The OEP model predicts development of farpoint exophoria as a response to an inability to sustain attention at near. At risk of oversimplification, the scenario is briefly as follows: The effort needed to function at demanding near tasks creates a drive to converge at a plane closer than accommodation. The patient becomes esophoric at near and must inhibit fusional convergence to maintain single vision. The habituated behavioral pattern of inhibition of convergence (or active divergence relative to accommodation) is an appropriate compensation to permit performance at near. This behavior pattern is then carried over to distance activities resulting in myopia or divergence excess. Such a patient would show near esophoria, reduced accommodative facility, a low PRA, and high NRA. The near base-out vergence finding would show a high blur since base-out prism permits convergence at a closer plane than accommodation. Once the break point has been reached, the recovery to fusion measurement would be low since the patient has been inhibiting fusional convergence. Each component of the prism vergence measurements has a different basis in this model and need not covary.

Skeffington[6] explains this sequence of adaptive behaviors as a response to the intense near demands of our society. Utilization of plus lenses at near satisfies the drive to converge closer than accommodate and permits the patient to maintain clear, single binocular vision without developing compensatory behaviors which then become inappropriate at distance. Application of near plus is expected to impact distance measurements by inhibiting the development of farpoint exophoria and/or myopia. Divergence excess strabismus usually begins long before school age and could not be due to the social demands of our culture in most cases. An alternative possibility is that a slightly high ACA ratio produces excessive accommodative convergence, requiring the patient to utilize fusional divergence at near to maintain single vision, setting a scenario similar to that postulated by Skeffington. Regardless of etiology, the measurement profile of the divergence excess patient is quite similar to that of the OEP B case. This similarity led me to treat divergence excess patients as if they were in fact OEP B cases. This has been my strategy for long-term management of these patients.

Most patients with divergence excess whom I have encountered demonstrate poor oculomotor control on a monocular basis and accommodative inefficiency along with their binocular problem, still further resembling the OEP B type case. These skills are trained along with fusion. Divergence excess patients treated in this manner follow the pattern predicted by the Skeffington model. Almost invariably, the measurements resemble a B case as alignment is achieved. At this point a near add is called for based upon OEP precepts, the near phoria is eso and the add normalizes both near prism vergence blur findings and the PRA-NRA relationship. The divergence prism vergence measures may actually be lower than the convergence range. Vergence range extension training may be undertaken at this juncture, but the purpose is to normalize binocular function rather than to develop compensation to overcome exophoria. Both divergence and convergence are developed along with voluntary convergence on non-fusable simultaneous perception targets. Near plus is prescribed in bifocal form to satisfy the drive to center (converge) closer than the plane of identification (accommodation). This has a salutary effect on the long-term stability of the condition. With the need to adapt at near relieved, farpoint exophoria (which was induced by the near adaptation) often reduces. Those patients who continue to utilize their reading lenses after formal training is completed often show gradual reduction of far exophoria over a period of years.

This approach to treating intermittent strabismus of the divergence excess type has been very successful. Patients respond rapidly and show little or no regression after completion of formal training. In addition to resolution of the cosmetic problem, improvement in scholastic and/or athletic performance is almost invariably reported.

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