OPTOMETRIC MANAGEMENT OF PATIENTS WITH INCOMITANT STRABISMUS

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Abstract

Once active disease processes have been ruled out or diagnosed and treated, optometrists can provide interventions to reduce the symptoms and cosmetic concerns of patients with incomitant strabismus. The author presents 15 guidelines for nonsurgical treatment. The paper includes the monitoring and treatment of the most common incomitant conditions including: palsy of the fourth and sixth cranial nerves, Duane's Retraction Syndrome, Inferior Oblique overaction, Brown's Syndrome, and "A" and "V" patterns. The treatment options considered include optometric vision therapy, prisms, occlusion and patient counseling.

Key Words

"A" pattern strabismus, bifocals, Brown's tendon sheath syndrome, Duane's retraction syndrome, fourth nerve palsy, inferior oblique overaction, incomitant strabismus, non-concomitant strabismus, occlusion, orthoptics, prisms, sector occlusion, sixth nerve palsy, vision therapy, "V" pattern strabismus, yoked prisms

INTRODUCTION

Von Noorden has written that strabismus is *comitant* if "the deviation is, within physiological limits and for a given fixation distance, the same in all direction of gaze." He further states that the word *comitant* is derived from the word concomitant,[1 (p130)] which in turn was derived from the Latin com, meaning "together," and *comitari* "to accompany,"[2] suggesting that the eyes accompany one another in all fields of gaze.

Strabismus is *incomitant* (also known as noncomitant and nonconcomitant) if the magnitude of the deviation varies in different fields of gaze.[1] For example, a patient with orthophoria (parallel visual axes) to the far right, 5 prism diopters of esophoria in primary gaze and 10 prism diopters of esotropia to the far left is demonstrating incomitancy. Griffin proposed grading the condition: the incomitancy is "mild" when there is a 6 to 10 prism diopter change in deviation, "moderate" with an 11 to 15 prism diopter change and "marked" at 16 prism diopters or more.[3]

Incomitancies are caused by both innervational and mechanical factors on the globe.[3] Some incomitancies are longstanding and not suggestive of general health problems. Others are of recent onset and are generally accompanied by diplopia. Such incomitancies, whose angles are currently increasing, can signal the presence of active disease processes and require a consultation from appropriate medical specialists.[4]

In the following discussion, it is assumed that the incomitancy has been diagnosed and its etiology has been determined. The purpose of this paper, then, is to offer a model of optometric care for patients with incomitant strabismus that is long standing, or, if of recent onset, active pathology has been ruled out or is being treated. I first present 15 guidelines that I have found useful in the management of these patients. These guidelines will then be applied to specific types of incomitant strabismus. The treatments will focus on optometric interventions that target the elimination of unwanted symptoms, improving overall visual performance, and addressing cosmetic issues.

GUIDELINES

1. Determine the functional consequences of the incomitant strabismus

Aside from the standard optometric protocol for the evaluation of strabismus,[5] I propose an emphasis on determining how the condition has affected performance: at school, at work, on computer tasks, during leisure time activities, while reading, while driving and in social situations. Has the patient been forced to give up activities once enjoyed, such as reading or sports? Does the effort required to maintain aligned eyes cause fatigue during computer or deskwork? Do headaches, indistinct or double vision occur during activities that are desirable or critical? The answers to these questions go far to determine the patient's priorities and the strategy for optometric management.

2. Determine and document the characteristics of diplopia

The clinician should document the frequency and nature of diplopia when it is present. Thus, the patient should be asked

to estimate the frequency of double vision, whether it is more noticeable when looking in particular directions, and during which activities the double vision is most distressing. The answers, again, will help to further determine the patient's priorities and the strategy for optometric management.

3. Determine a realistic range of fusion for the patient

The ultimate therapeutic goal is to provide clear, comfortable, and single vision over as wide a motor range as possible. However, the extent of the binocularly fused field will vary according to the magnitude of the strabismus and the incomitancy. Although not always attainable, a goal of 20° should be the target; even patients with normal binocularity tend to use head movements rather than eye movements to view objects past 10 or 15° to the side of the midline.[1]

4. Quantify all aspects of the strabismus

A patient's subjective evaluation of treatment results is an important indicator of the therapeutic success. Nevertheless, objective findings provide an equally important dimension and allow for comparison should any new or undetected pathology later become apparent. Thus, the clinician initially should use precise prism neutralization to quantify and document the strabismus and incomitancies in all directions of gaze.

Measuring the extent of ductions (monocular pursuit eye movements) especially in the affected fields of gaze, provides for later comparison should there be any loss or gain of muscle function. Similarly, versions (binocular pursuit eye movements) provide an excellent way to quantify gains, especially when diplopia exists. The extent of the patient's zone of single vision can easily be estimated. A patient might initially have single vision greater than 40° above and to the right, but have double vision 5° to the left of primary gaze and 10° below primary gaze. Upon reexamination, that patient might now have single vision 20° to the left of primary and 25° below—a clear example of progress.

5. Minimize the extent of the field of vision occluded

Occlusion is a viable option for patients who are experiencing constant diplopia.[3] While fully occluding a patient's deviating eye will eliminate the diplopia, such total occlusion constricts the overall field of vision and can have significant functional consequences: essentially, visual information that the patient has used is now unavailable because a significant portion of the total field is missing. I have found that such complete occlusion is seldom necessary. Occlusion of a sector of the deviating eye's field is usually sufficient. A one centimeter circular cut of translucent tape applied to the center of the lens before the patient's deviated eye is frequently all that is necessary. At other times, nasal occlusion (the translucent tape covering one lens from the patient's nasal pupil margin to the frame's nasal eye wire) can be applied before the turned eye, or even the straight eye, and will eliminate any annoying diplopia without limiting the patient's peripheral field. Full occlusion should, whenever possible, be saved for active therapy periods designed to maximize ductions.

6. Use ocular calisthenics

Ocular calisthenics can be defined as techniques that employ vigorous monocular eye-movements to extend a muscle or muscle's range of motion. Thus, for a patient with reduced abduction of the right eye, the clinician uses such calisthenics to extend the range of abduction to the patient's right. The calisthenics can be worked by holding the head still and moving the fixation target or by using a stationary target combined with head movement.[4] Encourage the patient to look as far to the side as possible. To facilitate this, direct the patient to place a pickup stick into a drinking straw (tip of the straw aimed at patient's eye). Targets demanding acuity can also be useful, because acuity requires accurate fixation.

The purpose of these ocular calisthenics is to reduce any contractures or adhesions and restore the greatest function possible in the paretic or damaged muscle.[3]

7. Begin where the eyes are aligned or most nearly aligned

To increase the range of single vision, begin where fusion is strongest and only gradually move into the fields of action of any affected muscles. If a patent's eyes are most grossly misaligned looking down and to right and aligned when looking up and to the left, begin fusion techniques up and to the left. Once all fusional tasks included in the treatment plan are accomplished in the "strong" direction, slowly move into the affected fields.

8. Start binocular enhancement therapy with large, peripheral targets

In my experience, strengthening peripheral fusion, rather than stressing central detail, is the key to maintaining aligned eyes when fusion has been made fragile by incomitancy. Therefore, I propose that binocular therapy should begin with large targets outside of instruments, and should avoid small targets in an instrument designed to occlude peripheral vision. The quoit and clown vectograms[a] are excellent targets for such a purpose. Encouraging the patient to be peripherally aware will foster the appreciation that during base-out demand the target appears *smaller* and to moves toward the patient (*in*), and during base-in demand the target appears *larger* and moves *out* (SILO).[6] I find that patients who limit their attention to a central region, or fail to integrate central and peripheral awareness have difficulty appreciating SILO. Therefore, stressing SILO awareness during therapy rewards peripheral awareness at a perceptual level.

Such vectographic therapy becomes more peripheral and effective when an overhead projector is used to focus the targets onto a silvered wall or screen (the silver allowing the Polaroid effect). Whatever the target, the clinician should encourage the patient to concentrate on fusing the outside of the target until its central details align. If the patient appreciates global stereopsis, the computer generated randot stereograms supplied by Computer Orthoptics[b] are also excellent tools.

9. Encourage the use of peripheral awareness in natural seeing conditions

Once the patient has been trained to use peripheral awareness to fuse targets in the therapy room, I propose showing the patient how to use such peripheral awareness to eliminate diplopia in everyday seeing in the fields of gaze where fusion is possible. For instance, if a patient sees a light switch doubling slightly, teach that patient how to use peripheral awareness to fuse a nearby door or the entire wall. Such peripheral fusion will generally eliminate

the central diplopia. The patient needs to be taught that staring with more effort at small, central objects will only increase the double vision.

10. Use cover-uncover-recover

Developing divergence and convergence ranges serves to strengthen fusion. However, they often do little to reduce the angle of strabismus. In the real world, smooth prism vergences seldom exist. Rather, what is required is the more dynamic re-establishment of fusion once it is lost. This occurs whenever an eye is occluded by the nose or the patient blinks or looks from near to far.

The following technique is useful in establishing this dynamic aspect of fusion. The patient views a target situated in a field of gaze where fusion is possible with only moderate effort. The clinician uses an occluder to cover the normally deviating eye. After several seconds, the occluder is removed (uncover), and the patient is encouraged to use peripheral awareness to recover fusion. The "cover-uncover-recover" procedure is repeated in that same field of gaze until fusion is rapid and effortless, even when the length of occlusion is increased to 15 seconds. The clinician then switches the occluder to cover the normally aligned eye and repeats the procedure until reestablishment of fusion is effortless. Next, the technique is expanded to include all other fields of gaze in which fusion is possible, but requires more effort.

11. Add versions to fusion techniques

Because patients with incomitant strabismus have to overcome a different deviation in every position of gaze, it is important to train such patients to maintain fusion when the fusion target is moving. This should be worked both with the patient's head still and the target moving, and with the target still and the patient's head moving. Cover-uncover-recover can also be added during such movement.

12. Avoid diplopia

Do not stress awareness of diplopia when incomitancy is present. Avoid procedures which encourage either physiolgical of pathological diplopia. For instance, do not use the Brock string. In my experience, many patients have learned to suppress when their eyes are deviated, and to fuse when their eyes are aligned. The principles covered in numbers 6 and 7 above allow the clinician to make use of this adaption. The therapeutic goal is to reinforce use of the two eyes when there is alignment, but to allow suppression when there is misalignment.

13. Prescribe prism as necessary, but with caution

When prism is necessary to eliminate diplopia, prescribe the minimum amount that eliminates diplopia in primary gaze. The clinician must keep the potential negative effects of prism adaptation in mind. Patients may "eat up" the initial amount and require increasingly greater amounts.[8] The increased amount of prism can become cosmetically objectionable, and exclude the later prescription of contact lenses. I propose that prescribing prism to patients without good peripheral fusion is inviting an increase in angle. The techniques outlined in numbers 8 and 9 above will reduce the likelihood of prism-induced angle increases.

For patients who have to turn the face to the side because of a limitation of gaze, yoked prisms frequently can improve functioning and reduce the need for the face turn.[7] Thus, for a patient who must make a face turn to the left, the prisms are set with each base facing left, i.e., base out OS, and base in, OD.

14. Promote head turning and head tilting as necessary

Most patients with fusion and long-standing incomitancies will have already learned to adjust head position for greater comfort and efficiency, as well as to avoid diplopia. However, for those who suppress when an eye deviates, it is beneficial to instruct them to use head movements when looking into the affected field to minimize cosmetic problems. For example, the patient who cannot abduct to the left, should be instructed to turn the head to the left.

To encourage this head movement, the clinician holds a hand mirror to provide the patient with feedback about eye position. The patient follows the mirror image of his eyes into the affected field of gaze, moving his head rather than eyes. In unaffected fields of gaze, the patient can continue to use eye movements. Training this combination head and eye pursuit movements is continued until the patient's ability to maintain aligned eyes becomes second nature.

A mirror is also useful in training saccades for patients who are unaware when an eye deviates. The clinician uses a pencil for a fixation target in the patient's unaffected field of gaze and a mirror for a target where fusion is limited. These fixation targets are maintained to the far right and left while the clinician varies their height, encouraging the patient to alternately fixate the pencil and mirror. The clinician coaches the patient to move only the head when looking at the mirror but, after returning the head to primary position, to rely on accurate eye movements when looking at the pencil. This procedure is programmed until the patient has learned, on a reflex basis, to move head rather than eyes when necessary.

15. Counsel the patient

Patients should be informed and educated about the nature and limitations posed by their incomitancies. In addition, the clinician can suggest measures to be taken to minimize some of the everyday problems that may exist. For instance, the clinician should counsel the patient with restrictions to the right to seek a position from which people can be greeted and conversed with to the left. With this knowledge, the patient can arrange office chairs accordingly. Computer screens can similarly be situated to the left to maximize comfort and efficiency.

Parents of children with incomitancies can be counseled on such matters as school seating and the best area to place reading material. Parents and teachers can then use this information to maximize the child's performance.

TYPES OF INCOMITANCIES

In the following discussions, the ordering of the previously suggested interventions is a product of the patient's priorities and the clinician's judgments and experience.

Fourth Cranial Nerve Palsy

General considerations

The fourth nerve supplies the superior oblique (SO), which is responsible for lowering the eye when the eye is adducted. If, for instance, this muscle's action is reduced in the right eye, the patient will have a right hyperphoria or hypertropia when looking to the left. The hyper will reduce the farther the patient looks up or to the right, and increase the more the patient looks down or to the left.[9]

There are postural reflexes that seek to keep the eyes oriented vertically when the head is tilted to either side.[10] Thus, when the head is tilted to the right, there is innervation to intort the right eye and extort the left eye. Since the SO is responsible for this intortion, if a patient with a right superior oblique palsy tilts the head toward the right shoulder, the right hyper will increase. In summary then, a patient with a right SO palsy manifests a right hyper which increases to gaze left and head tilt right.

Patients generally position their heads to minimize or eliminate diplopia. Thus, a patient with a SO palsy will habitually rotate the face away from the affected eye and tilt the head toward the shoulder opposite the affected eye.[11] In time, the musculature of the neck and shoulders will conform to this position. Indeed, such muscle changes can provide evidence that a fourth nerve palsy is of long duration.

Treatment

Patients with SO palsies will have the least difficulty fusing targets positioned higher than their eyes and to the side of the affected eye. They will have more difficulty fusing when looking downward, and much more difficulty fusing targets to the side of the midline opposite of the affected eye.

Using peripheral targets, the clinician begins working cover-uncover-recover up and to the same side as the patient's affected eye and gradually moves across the midline and down, until the patient can fuse in this more difficult direction. Versions are worked, again with peripheral fusion targets, beginning up and to the affected eye's side where fusion is strongest and gradually working down and to the side where fusion is weakest. Similarly, base-in and base-out fusion ranges are worked starting in a "strong" position and moving into more difficult positions as the range of fusion expands.

For patients with a SO palsy, convergence is difficult, because during convergence the affected eye is forced to adduct. To enhance convergence, the clinician uses jump vergences in free space. If the patient can perceive global stereopsis, the randot E makes an excellent near target, held as close to the patient's face as convergence permits. If the patient does not experience stereopsis, the clown vecto- gram may serve as the near fixation target.

Another convergence building activity requires the patient to place a pickup stick into a drinking straw that the clinician holds parallel to the patient's face. In this way, stereopsis is required for the stick placement. The clinician first positions the straw as far away as the patient can reach. The stick is then held as close to the patient's face as the patient can converge. The clinician continues to alternate the position of the stick to these far and near locations.

Ocular calisthenics should be a part of the therapy plan.[3] The goal is to increase the field of motion down and across the midline of the affected eye. The patient will usually report discomfort, and the procedure should be carried out until discomfort is eliminated at best, or minimized at least. As progress is made, the patient should be encouraged to tilt the head slightly toward the shoulder of the affected eye while maintaining fusion. Similarly, while maintaining fusion, face rotations are worked in both directions but especially away from the affected field of gaze.

Patients whose condition is longstanding frequently exhibit a head tilt of cosmetic concern.[11] To reduce this head tilt, have the patient stand in front of a mirror. With eyes closed, the patient should tilt head right and left, and then attempt to straighten the head with eyes still closed, before opening them and checking accuracy of head position in the mirror. This procedure is used until the patient can maintain upright head position, with eyes open or closed. If the muscles on one side of the neck have contracted from a habitual head tilt, gentle stretching of the neck muscles can be encouraged by having the patient tilt the head in opposite direction.

Once the patient has clear, single vision over the largest possible range, the patient can be counseled to adjust computer screen and reading matter up and to the same side of the midline as the affected eye. For prolonged reading, a music stand may be useful. A lower chair positioned to the correct side should make computer work easier.

When active therapy is complete, computer generated randot stereograms can be prescribed for maintenance therapy at home. Since fusion is more difficult below the midline, reading glasses, when necessary, should be prescribed in single vision rather than in bifocal form. If yoked prisms with their base opposite the affected eye improve function and allow better head alignment, present this option to the patient. These prisms can be incorporated into a habitual spectacle prescription, or prescribed for "as needed" use (deskwork and so forth) for patients who do not want spectacles for full time wear.

Duane's Retraction Syndrome

General considerations

In 1905 Duane[12] described 54 cases in a paper entitled, "A congenital deficiency of abduction associated with impairment of adduction, retraction movements, contraction of the palpebral fissure, and oblique movements of the eye." To this day, the title provides a fairly accurate picture of the syndrome which came to bear Duane's name. Huber[13] has provided a classification system that further divides the syndrome into three types:

Duane I: Totally, or greatly constricted, abduction of the affected eye. Normal, or slightly reduced, adduction of the affected eye. Narrowing of the palpebral fissure and retraction on adduction, widening of the palpebral fissure on attempted abduction.

Duane II: Limited to absent adduction with exotropia of the affected eye. Normal or slightly limited abduction. Narrowing of the palpebral fissure and retraction of the globe on attempted adduction.

Duane III: Combination of limitation, or absence, of both abduction and adduction. Retraction of the globe and narrowing of the palpebral fissure on attempted adduction.

The etiology of the entity may include anatomical and innervational factors. On an anatomical basis, the lateral rectus may become fibrotic and no longer responds to nerve impulses. As for innervation, the sixth nerve may innervate the lateral rectus only when adduction, rather than abduction is attempted. Thus, not only is abduction blocked, but because the sixth and third nerves provide simultaneous innervation to the medial and lateral recti during attempted adduction, the eye is retracted into the globe. In the case of exotropia with reduced adduction and retraction of the eye during abduction, the third nerve may be sending signals to the lateral rectus.

In considering surgery, von Noorden writes:[1(p.403)] "The results of surgical treatment of the retraction syndrome often

have been disappointing. For this reason we prefer not to operate when binocular vision is present with the eyes in primary position, or if it can be maintained with only a slight head turn."

Because of both the anatomical and nerve supply problems, it would—in theory at least—appear that non-surgical treatment would be just as disappointing. The author has found, however, that it is possible to: 1) increase both sensory and motor fusion in primary gaze, 2) counsel the patient how to avoid cosmetic issues, and 3) increase the range of motion in some cases.

Treatment

Since retraction syndrome is congenital, concerns regarding recent onset do not apply except that other ocular and systemic abnormalities have been associated with the syndrome. Therefore, a thorough ocular evaluation and a general physical will be required to rule out other malformations, especially hearing defects.[1]

Therapy is begun where the eyes are aligned, which is usually in primary position or a little to one side or the other, depending if the right, left, or both eyes are involved. The clinician can utilize binocular enhancement, cover-uncover-recover, and fused versions as described in guidelines 8, 10 and 11. Both monocular and binocular accommodative skills should be maximized, including amplitude and flexibility. Begin ocular calisthenics with vigorous stretching in all directions, but especially to increase adduction and abduction. It is often easier to increase abduction when the eye is elevated, probably because of increased help from the oblique muscles. Therefore, when training abduction, require the patient to stretch not only outward from the midline, but up and outward. Once maximal abduction has been obtained in superior gaze, the abduction is maintained while the eye is lowered.

Because of adduction limits, many Duane's patients exhibit convergence insufficiency, which can be symptomatic. Convergence is trained as described under SO palsy.

Counsel the patient to place desk and computer work either straight ahead, or slightly to the right or left, depending on which eye is involved. Have the patient practice head movements, rather than eye movements, especially in the field where abduction is reduced, because attempts at abduction frequently cause disfiguring over-convergence in the unaffected eye.

The goal with the retraction syndrome patient is to obtain the strongest possible fusion in primary gaze, and the largest possible zone of binocular vision. Yoked prisms, with their bases in the same direction as the affected eye, might prove beneficial, especially if the patient's head otherwise has to be turned to enhance function.

Sixth Cranial Nerve Palsy

General considerations

Because the sixth nerve innervates the lateral rectus, abduction is limited in the affected eye. Versions, and/or cover testing will reveal an increasing eso deviation in the affected direction. For instance, ortho- phoria may be present to the side opposite of the affected eye, 10 diopters of esotropia in primary gaze, and 20 or 30 diopters of esotropia to the side of the affected eye. As with other forms of paralytic strabismus, fixation with the unaffected right eye reduces the deviation, while fixation with the affected eye causes the angle to increase.[3]

Treatment

In the case of a recent onset deviation, once the cause of the paresis is determined and any necessary medical intervention is begun, optometric intervention can begin as well. A Fresnel prism can be used to eliminate diplopia in primary gaze. The prism is placed over the affected eye to encourage fixation with the non-affected eye, and thus minimize the angle. In considering patching, determine the effect of a nasal occluder on the unaffected eye. This occluder will eliminate diplopia when the patient looks into the affected field, but will nonetheless encourage the patient to abduct the affected eye.

When a full paralysis with diplopia exists, and the patient cannot abduct the affected eye at all, place a patch over the entire central portion of the spectacle lens of the affected eye. The occluder is ideally as small as possible to prevent diplopia, while allowing some peripheral awareness out of the affected eye.[11]

If the paresis is mild, yoked prisms with bases in the opposite direction as the affected eye (base right for a left lateral rectus palsy), may help. At times, combining low base-in prism in front of the unaffected eye, combined with higher base out prism in front of the affected eye may be useful, allowing the paretic left eye to deviate slightly, while moving the entire field of gaze away from the affected field.

As for vision therapy, the treatment is the same as for Duane's, except that less work will have to be done with adduction. In cases where there is a mild paresis, rather than a full sixth nerve paralysis, the prognosis is favorable. In the case of a full paralysis, where the affected eye cannot abduct past the midline, the prognosis for improving fusion to the affected side is limited.

Brown's Tendon Sheath Syndrome

General considerations

In this syndrome, the elevation of the adducted affected eye is blocked. The ability to fuse in primary gaze may, or may not, be reduced. Frequently there is depression of the adducted eye due to mechanical factors. There is also divergence in up gaze.

Brown's syndrome is usually caused by a difficulty of the tendon sheath of the superior oblique muscle to pass through the trochlea. This problem allows the muscle to fully contract to depress the adducted eye, but does not allow the tendon to pass through the trochlea far enough to allow contraction of the inferior oblique, thus the restriction of elevation.[14,15]

The effort to overcome the blockage increases the innervation to the superior rectus (yoke muscle) of the other eye. Thus, the non-affected eye will deviate upward when the patient tries to look upward when the affected eye is adducted. This type of incomitancy does not usually suggest the presence of systemic disease. However, it can follow trauma or inflammation of the superior oblique tendon.[11]

Paresis of an inferior oblique could mimic Brown's syndrome. The differential diagnosis is the forced duction test.[11] Here, the patient is encouraged to look in the desired field of gaze, while the doctor uses forceps to move the locally anesthetized eye in the desired direction. If the eye cannot be moved, the limitation of gaze is attributed to Brown's syndrome, providing there is no history of trauma that could have caused a blowout fracture of the orbits. In addition to the forced duction test, divergence in upward gaze, normal movement of the contralateral su-

perior rectus, and depression in adduction all support the diagnosis of Brown's over that of inferior oblique palsy.[1]

Surgical treatment for the condition is not advocated when fusion is comfortable in primary gaze and there is no need for a head turn.[1] That the syndrome may at times be treated non-surgically is suggested by several findings. First, Girard[16] reported a case in which full motility was recovered after repeated attempts to elevate the eye in adduction. In addition, von Noorden cited 10 other sources that found a similar result and five sources in which spontaneous recovery occured. He also reported that only 14 of 126 patients were greater than age 13, again suggesting that recovery may accompany aging in the majority of cases.[1]

My recommended treatment for this condition includes using vigorous ocular calisthenics to enhance elevation of the affected eye. Three methods follow for the patient with an affected right eye.

1) With the left eye occluded, encourage the patient look to his left and then try to elevate his eye. During such attempts some type of hand-eye activity is performed, such as the patient pointing with a pickup stick at, and reading, small individual letters. This requires precise, central fixation.
2) Instruct the patient to look up and down with the non-occluded eye. Begin in primary position and gradually work nasally.
3) Encourage the patient to elevate the eye in primary position, and then slowly move the eye nasalward without losing the elevation.

As the calisthenics are performed, the patient may notice a discomfort similar to that you would feel in the backs of your legs if you were trying to touch your toes. The stretching is continued until the ability to elevate the eye while abducted is normal, or until no change is seen over a 4-week period. In addition, such patients can be worked as described in the Guidelines section, including solidifying central fusion, and counseling the patient how to avoid the cosmetic disfigurement.

Overaction of the inferior oblique

General considerations

The inferior obliques' function is to allow elevation of the adducted eye. Esotropia is often accompanied by overaction of these obliques, which results in a hyper whenever an eye is adducted. In such cases, no vertical deviation may be present when the eyes are in primary gaze. In leftward gaze, the right eye deviates upward, while in rightward gaze, the left eye deviates upward.[1]

Treatment

Initiate the treatment with the minimization, or elimination, of the esotropia in primary gaze as with any other non-surgically treatable esotropic patient. This includes heavy utilization of cover-uncover-recover so that the patient becomes aware of what it feels like to align the eyes. After the eyes are thus aligned with the best fusion possible, the overaction of the obliques may no longer be of concern, since the eyes no longer move as far nasally as before. If the vertical components still create a problem, the following is recommended:

Since the nose serves as an occluder for a fully adducted eye, neither diplopia, nor Stereopsis, can be used as feedback for alignment. Thus, the best feedback becomes auditory. To make use of such feedback, have the patient look to the side until an eye just begins to deviate upward. While the eye is in this position, encourage the patient to pull the eye down. Providing enough cover-uncover-recover work has been done during earlier therapy, the patient will generally be able to comply. Next, use cover-uncover-recover to both sides. When the patient can rapidly recover alignment when either eye is adducted, begin to stress pursuits and saccades, and provide verbal feedback whenever an eye deviates. The goal here is to teach the patient to maintain alignment even when making wide pursuit or saccadic eye movements.

If necessary, such patients can be counseled on moving head rather than eyes during social situations.

"A" and "V" pattern strabismus

General considerations

An "A" pattern exists when the eyes are converged more in upward gaze than in downward gaze. Examples would include an esotropic patient whose angle increases in upward gaze, and an exotropic patient whose angle increases in downward gaze. "V" patterns exist if the eyes are more converged in downward gaze and less converged in upward gaze.[11]

Treatment

The most important consideration in treating these conditions is to stress cover-uncover-recover above and below primary gaze, and working versions above and below while using fusion targets. Providing that fusion is strong in primary gaze and there is not more than 15 prism diopters of increase in angle above or below, prognosis is good.

If the greatest deviation is below primary gaze, whether eso or exo, patients should be counseled to hold their reading material higher. In such cases single vision reading glasses are preferable to bifocals. Base-down yoked prisms may prove beneficial.

SUMMARY

The treatment of incomitant strabismus provides special challenges, which may require the use of sector occlusion, prisms and vision therapy. Despite these challenges, the optometrists goal remains to maximize the patient's visual functioning for a fuller life.

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EDITORIAL continued

of VT. Both organizations also offer optometry students special considerations in terms of educational meetings and print material.

Undoubtedly, these organizational actions are having a positive impact. However, an additional group, namely, private practitioners, can have provide a further impetus. A program that is already in effect involves establishing one's office as an externship site for 4th year optometry students. There is a new reality for students who experience the effective and efficient application of VT in the "real world". This is often not possible in an academic setting; here, one must deal with curricular as well as institutional constraints. Another method is for private practitioners to inform their non-VT optometric colleagues about recent advances in the field. This can be done with presentations to office staffs, by updates on research, and by lunch and dinner conversations. While the present non-VT practitioners will probably not include that intervention into their practices, it can alert them to visual problems that can be treated by VT. I know that some of our readers are already engaged in this type of activity.

Both of these methods require the private practitioner to expend significant time and effort. However, if the present realities are to change, these efforts are necessary.