Optometric Alternatives to Amblyopia Occlusion Therapy

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Occlusion as the treatment for amblyopia is not the therapy of choice in modern optometric vision therapy. Successful training procedures such as single-letter monocular accommodative rock, three-letter monocular accommodative rock, calisthenic eye movements, and monocular fixation in a binocular field are described. Key Words: amblyopia, occlusion, eccentric fixation, binocularity

At the 1994 Amblyopia Panel Discussion presented at the Annual Meeting of the College of Optometrists in Vision Development, the four panelists were asked, "Do you use full time patching?" Two of the panelists answered, "No." The other two answered, "Rarely."

Occlusion therapy was first suggested by Buffon in the late 1700's. It seems that in modern optometric vision therapy practice, at least, full-time occlusion as a primary therapy for amblyopia is rapidly following the path of other 18th century medical practices, such as the use of leeches.

In our practice, which is devoted solely to optometric vision therapy, we have not used occlusion therapy in the past decade. Instead we are successfully employing a wide variety of vision therapy procedures. Samples of the more successful procedures are discussed here.

At the 1994 COVD Annual Meeting.

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SINGLE-LETTER MONOCULAR ACCOMMODATIVE ROCK (SL-MAR)

Perhaps our most successful acuity development procedure is monocular accommodative rock using a single-letter presentation. The procedure is performed using two charts: one is composed of the smallest letters that the patient can discern when the chart is positioned 4 to 6 inches from the amblyopic eye, and the other consists of 10 rows of 20-foot letters, 10 to a row, positioned as far away from the patient as acuity will permit.

While standing next to the 20-foot-letter chart, the therapist holds a 9 x 11-inch shield of thin cardboard with a 1-inch-square aperture centered in the card. The therapist uses this shield to isolate one 20-foot letter on the chart at a time, while the patient, with his or her better eye occluded, stands as far away from the 20-foot-letter chart as he or she can and still discern most of the letters that are displayed to him. The patient reads one letter from the near chart, holding this chart as close to his eye as possible. He then reads whatever 20-foot letter the therapist is displaying. As the patient improves at this activity, he or she
is backed further and further away from the 20-foot-letter chart and holds a near chart closer and closer. This procedure is performed 10 to 15 minutes a day until no further improvement is noted for at least 8 weeks.

Patients with amblyopia generally have much more difficulty seeing letters that are bordered by other letters or contours, the “crowding phenomenon.” One of the reasons for the success of SL-MAR is that it bypasses the crowding phenomenon. A second reason for the success of the procedure is that, because accommodation is controlled by the central retina, accommodative procedures encourage central fixation.

THREE-LETTER MONOCULAR ACCOMMODATIVE ROCK (3L-MAR)

Once the patient has either plateaued at some given distance or has reached a 20-foot distance from the 20-foot-letter chart, the therapist’s cardboard shield with the 1-inch-square aperture is now replaced by a shield with an approximately 1 × 2½-inch aperture to allow the patient to see three letters (horizontally) at a time. Because the three letters seen through the shield aperture are close together, the patient now experiences the crowding phenomenon. As a result he or she will again have to move closer to the 20-foot-letter chart to distinguish the letters. As with SL-MAR, the patient over a period of weeks, again works his or her way further and further away from the 20-foot-letter chart until 20 feet is reached or his progress plateaus.

This procedure is programmed when examination reveals that single-letter acuity is either good or plateauing and that single-letter acuity is better than whole-line acuity. It is an excellent procedure for reducing the crowding phenomenon.

SL-MAR and 3L-MAR are effective with refractive amblyopia whether unilateral or bilateral. Thus if a patient’s prescription is OD Plano, OS + 4.00, or if the patient’s prescription is OU + 4.00 – 3.00 × 180, so long as there is no constant strabismus present, the Monocular Accommodative Rock procedures can be used as described in this article. In the presence of amblyopia associated with strabismus, the procedure may need to be modified as described in the next section.

CALISTHENIC EYE MOVEMENTS

Eccentric fixation is a monocular condition in which the patient thinks he is looking directly at a target but is actually directing his eye above, below, or to either side of the target. If a patient, for instance, is looking at a letter with his right eye, but his eye is actually turned in slightly toward his nose and thus pointed slightly to the left of the target, he is said to have nasal eccentric fixation. The further to the side the eye is misdirected, the more reduced acuity will be. Eccentric fixation generally accompanies constant, unilateral strabismus.

The presence of eccentric fixation complicates amblyopia therapy because, when a patient practices seeing when fixation is eccentric, it is possible to further embed the eccentric fixation. For this reason SL-MAR and 3L-MAR must be modified when unilateral strabismus with eccentric fixation is present.

Ludlam has noted that in the case of unilateral esotropia there is generally a slight limitation of gaze in the affected eye. Ludlam suggested the use of vigorous calisthenic eye movements in the opposite direction of the eye turn. For instance, with a left esotropia, you would have the patient stretch his left eye outward (abduction). Ludlam found that this procedure was useful in reducing the angle of deviation in unilateral strabismus.

Ocular calisthenics are also highly useful in most cases of eccentric fixation. If, for instance, a patient with left unilateral esotropia has nasal eccentric fixation, ocular calisthenics to the patient’s left (abduction of the left eye) will generally disrupt the eccentric fixation. To determine if this is true, a visuscope is used. In the case of this left unilateral esotrope, the clinician would occlude the patient’s right eye and have the patient fixate the visuscope target with his left eye. The clinician would then note the patient’s fixation pattern. If the fixation were nasal eccentric, the clinician (without changing his own position in front of the patient) would coach the patient to stretch his eye as far as possible to the left for about 10 to 15 seconds. Next the clinician would instruct the patient to return fixation to

Journal of Optometric Vision Development
the visuscope target while the clinician again notes the fixation pattern. Usually, the eccentric fixation will have shifted to unsteady central fixation.

There are some exceptions to this procedure's success. Frequently it is necessary to repeat the stretching several times for the fixation pattern to shift. Rarely, in cases where the patient is found to have a very high angle (more than 10 prism diopters) of deeply embedded eccentric fixation, the calisthenic procedure may not be workable immediately. Occasionally calisthenics will produce a paradoxical effect: it may be necessary to stress adduction with nasal eccentric fixation or to stress abduction with temporal eccentric fixation. Because of these paradoxical responses, it is best to determine the direction of stretching with the visuscope.

Once the effect of calisthenics has been noted, the next step is to determine the duration of the effect. For instance, after the calisthenics unsteady central fixation may persist for 15 seconds before the pattern again returns to its eccentric position. The clinician would use this information on duration of response to tailor therapy. When doing an eye-hand coordination procedure, such as filling in Os in a magazine while the better eye is occluded, the patient would first "stretch" for 15 seconds and then fill in the Os for 15 seconds. If, on the other hand, visuscopy showed that the fixation pattern remained central for 30 seconds, then the patient would stretch for 15 seconds and fill in the Os for 30 seconds. The goal here is to work the eye-hand coordination procedure while fixation is unsteady central rather than eccentric. Once the effect of calisthenics on fixation is known, then calisthenics can be added to all eye-hand procedures.

In addition calisthenics can be added to the SL-MAR or 3L-MAR procedures by having the patient hold the near chart in a position where he will have to abduct, or if necessary, abduct his eye before viewing the 20-foot-letter chart.

With this simple modification, the SL-MAR and 3L-MAR procedures are equally effective for amblyopia with eccentric fixation. Moreover these procedures, when workable, are much easier to perform than many of the traditional pleoptic procedures for treating eccentric fixation.

MONOCULAR FIXATION IN A BINOCULAR FIELD

The procedures described above are highly effective in improving the acuity of the amblyopic eye when the good eye is occluded. They can, therefore, be substituted for full- or part-time occlusion. Like occlusion, however, by themselves these procedures suffer from a serious limitation.

Generally as soon as the patch is removed and light enters the good eye, information from the amblyopic eye is again ignored or suppressed. Thus, although occlusion therapies improve the vision of the amblyopic eye while the preferred eye is occluded, they do little to improve the performance of the amblyopic eye when both eyes are open. Realistically speaking, outside the pirate community, not many patients walk around wearing a patch. Thus how the patient performs with both eyes open is far more important than how the patient performs when one eye is patched.

With the limitation of occlusion procedures in mind, Cohen reported on a therapy concept called "monocular fixation in a binocular field" (MFBF). These procedures stress the use of one eye; thus the work is "monocular." At the same time the procedures call for both eyes to be open and seeing much of the visual field at the same time; thus the work is done in a "binocular field." This is accomplished by using either polaroid or anaglyphic material to allow both eyes to see the periphery while only the amblyopic eye can see some central target. For instance, if the patient were wearing red-green glasses with green lens over his right eye and a small, green sheet of transparent plastic were placed over the center of a chart of letters, both eyes would see the outside of the chart and the entire room blended red and green, but only the green right eye would be able to see the letters under the green plastic.

In our office we use MFBF in the following way. First, using an overhead projector we project a chart of letters on a 5-foot-square wall chart. The letter size is such that the patient, standing about 10 feet from the wall, can discern the letters when his good eye is occluded. Instead of an occluder, however, a red lens is placed in front of his good eye and a transparent sheet of green plastic is placed.
on the overhead projector so that the chart is green and can be seen only through the amblyopic eye. At first, the patient (because of suppression) will have to move closer to the chart to see the letters. Gradually, however, after several sessions of work, the patient will be able to see the letters at the same distance he or she could see them if his or her good eye was occluded.

When suppression has been reduced in this manner, the size of the green plastic is reduced so that a central portion of the chart can now be seen by the amblyopic eye only. Under these circumstances, the good eye can now see more of the distance chart. With more information entering the good eye, suppression of the amblyopic eye increases, causing the patient again to move closer to the letters to see them.

When the patient has moved back to the same distance he could see the letters if his good eye were occluded, the size of the green plastic is reduced again, and the procedure is repeated. The process is continued until only a tiny green square of plastic is used, and the patient, with almost the entire field of the good eye seeing letters, no longer suppresses his amblyopic eye centrally, at the same distance he could see the letters if his good eye were occluded.

This procedure, which might take many hours spread over several months, can be greatly accelerated by the following modification. Birnbaum has observed that many patients attribute their suppression to the glasses being worn rather than to their own visual system. Such remarks as “It went black” suggest that the patient thinks something is happening with the letters themselves out on the wall rather than with himself.

A patient can be coached, however, to take responsibility to the point where he says, “I made it go black” or “I made it come back on.” Shedding light on this process, Hubbard writes “full responsibility is not fault; it is recognition of being cause.” Thus in no way do we “blame” the patient for his suppression. Instead we teach the patient that he can cause, or not cause, the suppression. We accomplish this goal in the following manner. With the red lens covering the patient’s good eye, and a suitably sized green area on the letter wall chart, the patient is situated at a distance from the screen where the green area is seen as blinking on and off. The therapist then touches the patient on the temple closest to the good eye and tells the patient to “look out of this eye.” Most patients can shift their attention to the good eye and in so doing see the green square go black. The therapist asks the patient, “Were you able to make the square go black?” Next the therapist touches the patient on the temple nearest the amblyopic eye and instructs the patient to “look out of this eye.” When the patient can again see the letters through the green square, the therapist asks, “Were you able to make the letters come on?” Once the patient can make the letter “come on” or “go away,” the therapist begins to ask the patient to “make the letters go black” and “make the letters come back on.” When the patient can easily control the suppression, he is moved further away from the chart and the procedure repeated.

Since I began using this procedure, we have accelerated gains tremendously. Rather than flashing or shaking the target to reduce suppression on a stimulus-response basis, we are instead getting the patient to cause his suppression, on a voluntary basis. The procedure is repeated until the patient simultaneously uses both eyes, without suppression, on an automatic basis.

The overall sequence, therefore, is the following: (1) Patient suppresses his amblyopic eye on an automatic basis; (2) patient learns that he can cause or not cause the suppression and therefore takes responsibility for his suppression; (3) patient uses the procedure until binocularity without suppression is automatic.

**BINOCULARITY**

In addition to these procedures, patients with amblyopia are treated on a binocular basis just like any other patient. Patients with strabismic amblyopia begin the first session with a 4-foot-wide peripheral stereo target. Over time, target size is reduced until the best possible stereopsis that the strabismic condition will permit is gained. Other strabismic therapy procedures beyond the scope of this paper are used similarly.

In refractive amblyopia, computer-generated randot stereograms are used as soon as randot stereopsis can be appreciated. The
highest possible level of stereopsis as well as
good positive and negative relative accommoda-
tion and convergence are sought whenever
possible.

The goal of amblyopia therapy is a patient
who has the best possible acuity, stereopsis,
binocularity, and accommodation all inte-
grated with other visual information process-
ing skills. In other words, we want a patient
who is maximally efficient whether or not one
eye is covered or both eyes are open.

SUMMARY

In the past, occlusion therapy for ambly-
opia was popular, probably because it was sim-
ple for the doctor. For the parent and child,
however, occlusion posed other problems. Fre-
quently the child, confused, scared, and un-
able to function, rebelled against the proce-
dure, causing constant upsets in the family.
Because binocularity was not developed, as
soon as the patch was removed the eye was
immediately suppressed and acuity frequently
returned to lower levels. In some cases, chil-
dren were even forced to wear a patch to school
which, in many cases, created serious social
and academic problems.

In modern optometric vision therapy, oc-
closure is seldom used except for brief periods
during which other procedures which fully
stimulate the amblyopic eye are also em-
ployed. Stressing binocularity allows more
lasting results and a patient who functions as
a two-eyed individual. In addition, we have
found that the use of accommodative proce-
dures that control for the crowding phenome-
non, the use of ocular calisthenics to reduce
eccentric fixation, and the modification of
MFBF procedures (as well as all other binoc-
ular procedures) to allow the patient to take
responsibility for and control his condition
more quickly, can do much to speed and im-
prove the outcome of therapy—both for the
doctor and the patient.

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