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A STANDARDIZED TECHNIQUE FOR THE PROLONGED OCCLUSION TEST*

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ABSTRACT

The prolonged occlusion test is a valuable technique for distinguishing binocular from monocular problems, and for revealing latent heterophoria. Short periods of occlusion give only partial information. Long periods are not acceptable to most patients. A standardized technique of occlusion is presented which achieves maximum information with minimal patient inconvenience.

Perhaps one of the first references to be made to the use of any type of occlusion was by Paulus Aegineta, a Greek physician of the seventh century.

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He recommended wearing a mask which would extend below the nose and through which there should be an opening for each eye, so placed as to induce the eyes to assume direct positions in order to see through these openings. His ultimate objective, of course, was to correct a strabismus.

One of the first references to the therapeutic use of occlusion in the treatment of uncomfortable binocular vision was by Hilton[1]. It is the story of a physician's patient in about 1840 who was continuously prostrated by headaches and photophobia. Hilton relieved her discomfort and disabilities by "giving her eyes physiological rest by reducing the light entering them" by covering one eye with a bandage. She was ordered to change over to the other eye every two hours. The treatment was so successful that she gladly continued it for 20 years.

Prolonged occlusion as a diagnostic tool for revealing latent heterophoria was first reported by Marlow[2]. He claimed to have begun the use of monocular occlusion for diagnostic purposes as early as 1894, although his first paper did not appear until 1897. He describes the accidental discovery when a patient he had been treating complained of diplopia after having one eye bandaged for a week. This patient had never experienced diplopia before, and Marlow expressed the belief that monocular occlusion might be a new aid in the discovery of a latent binocular dysfunction.

In his monograph[3], Marlow reports 700 cases of prolonged occlusion. Of this total he made daily observations during the occlusion period to establish the time necessary to reach stability in the phoric response. He felt that a 24-hour occlusion had no effect in bringing about complete relaxation of the extraocular muscles. The highest degree of change was noted on the thirteenth day. By continuing the test five more days, there was no appreciable increase in phoria. In his final conclusion, he accepted seven days of occlusion on each eye for working purposes.

Charnwood[4] presented data which led him to conclude that the occlusion period should be ten days on each eye. Nevertheless, from his experimental work he felt two weeks on each eye would be better. This time period of two weeks for each eye was used at Dartmouth by Bannon and Roper[5].

Coachman[6] advocated the use of occlusion of one eye for two days, then measuring the phoric response, then repeating the procedure on the other eye. He, as previous investigators, felt that occluding an eye for just a few hours was inadequate to reveal a latent phoria. However, he concluded his discussion of this technique by stating that even this two-day period on each eye is a most trying period for the patient and ideally some method of shortening the time should be devised. He complained of the problem of getting the patient to wear the patch over the eye.

Prolonged occlusion has not been universally accepted as a diagnostic routine. During the years since Marlow's first paper, the literature has contained perhaps more criticism of the technique than commendation. Duane[7] questioned the value of the test, insisting it did not reveal true hyperphoria. Lancaster[8] conformed to this belief although he made use of a monocular occlusion on an indefinite basis if its use relieved the symptoms. Maddox[9] said of the test:

". . . a derelict machine is not so informative as a functional one, although we can learn something from it." Krimsky[10] perhaps summed up the criticism of prolonged occlusion when he wrote: ". . . Beisbarth[11] and Abraham[12] and others exposed the unsoundness of the occlusion test and it required a wealth of literature to finally show that prolonged occlusion is of no value to diagnosis."

Why this apparent contradiction among different investigators? A careful search of their respective writings reveals that the critics were those who used inadequate procedures. For example: the length of time of occlusion, the manner in which the findings were interpreted, and too few cases for adequate study.

Abraham's premise that prolonged occlusion was merely a subjective test for demonstrating Bell's phenomenon was founded on results obtained from occluding six patients. His important conclusion was that a right hyperphoria was manifest when the right eye was covered and left hyperphoria when the left eye was covered. In reality, this observation is of minimum importance. To bring order out of this apparent paradox there must be a standardization of the technique. In establishing a standardized technique for such a time-consuming and annoying test, three requirements must be satisfied if there is to be universal acceptance:

1. *The test must reveal information which is both comprehensive and useful.* If the results of any test are without useful meaning, the test is soon discarded. If the results cannot be applied to clinical therapy, it will remain as a part of investigative history. To be of widespread use and acceptance, it must solve problems of human beings and result in their living more comfortable and productive lives.

2. *It must cause only a reasonable amount of discomfort and time loss to the patient.* To be accepted by the patient, it should produce the minimum discomfort physically, and the minimum time loss from home, work, or school.

3. *It should be readily duplicated by different investigators.* Uniform results can only be had if investigators with like skills, using similar equipment, can reproduce findings with reasonable likeness.

WHEN TO OCCLUDE

The first question in the mind of the one who has never done a prolonged occlusion test is: "When should I occlude?" The basis for instituting this test is found in the case history. Latent binocular stress can cause many symptoms. These should be known and understood and a normal history should include the interrogation concerning their possibility. They are too numerous to mention here, but are tabulated elsewhere[13].

The visual analysis is not the deciding factor as to potential occlusion. Often the original analysis may show no vertical or horizontal heterophoria, yet post-occlusion results may reveal a substantial deviation. If the binocular dysfunction had been manifest on the original analysis, there would be no need for the occlusion routine; i.e., it would already be manifest and not latent.

MATERIALS AND EQUIPMENT NEEDED

No attempt should be made to do a prolonged occlusion test unless certain basic materials are on hand. The following are required:

1. *Material for occluding the eye.* Two types of occludors are used:

The first is Elastoplast Eye Occlusors (Duke Laboratories, Stamford, Conn.). These can be applied either directly over the closed eyelid, or a small cut can be made on each end, the ends lapped over and the bandage will bulge outward so that blinking will not result in an irritation of the eyelid.

For any who may be allergic to tape, the Johnson & Johnson sterile gauze eye pad is held over the closed eyelid by means of plastic tape. These eye pads are also more comfortable in very warm weather or if there is excessive lacrimation.

2. *Facial tissue.* Upon removal of the bandage, the eye is usually moist and somewhat itchy. A soft facial tissue is handed the patient for his greater comfort.

3. *Round plano prisms.* After removing the bandage, the patient must wear trial prisms; therefore, an adequate supply should be available. Usually a supply of both 42 and 44 mm round lenses is all that is needed.

Experience has shown that the following lens powers should be available: ½, ¾, 1, 1½, 2, 2½, 3, 4, 5 and 6 prism diopters. If these are in pairs, then almost any power combination would be readily available up to a total of 12Δ.

4. *Frames to hold prisms.* If the patient has a lens prescription which is necessary to wear, the trial prisms are put in clip-over frames and then adjusted to the patient's frame. These clip-over frames are the thin p-leaf type clip-over, which are easily shaped to the round lens. Once the frame has held a round lens, it is preshaped for the next trial lens. As today's frames are so often in the form of anodized aluminum, the prongs on the fit-overs should be coated in plastic to prevent marring the anodizing.

If the patient wore no previous Rx and has no refractive error, then these trial prisms can be put into a lightweight p-3 shape zylonite frame. Such frames are easily reshaped to accommodate a round lens.

5. *Adhesive remover.* If the adhesive from the bandage adheres to the patient's skin, it should be removed. Solitine is excellent for this purpose and does not have the pungent odor of ether or alcohol. It can be secured through a dental supply company.

OCCLUSION ROUTINE

After the necessity of doing prolonged occlusion is explained to the patient, and he understands all that is involved, he must decide to go through with the test. He should be warned of the problems of monocular vision: altered stereopsis, hazardous driving, not working in a hazardous occupation, caution on stairways, curbings, pouring liquids, etc.

The occlusion routine includes covering one eye for a full three days, then removing the bandage and retesting phorias and ductions. Immediately upon finishing, the other eye is occluded and the patient returns at the end of another three days for another examination. Great care should be taken to instruct the patient to have both eyes closed except during the actual testing procedure.

The most efficient procedure is to make two morning appointments for the patient, three days apart. The patient is given three bandages (a clean bandage for each day) and instructions to begin the occlusion immediately upon

awakening three days prior to the first appointment. It is not necessary for the patient to come to the office to have the bandage applied.

The question is often asked, "Which eye do you occlude first?" This is not a major factor, yet to limit the occlusion period to six days, one should try to have the non-hyperphoric eye covered first. This will have no relationship to dominancy, and, contrary to some published statements, eye dominancy is of no importance in determining the order of occlusion.

Before applying temporary prisms, however, the proper hyperphoria must be manifest. Herein lies considerable confusion to those seeing the post-occlusion phoria changes for the first time. It is difficult to reconcile that both a right hyperphoria and a left hyperphoria can be present on the same patient under different testing conditions, yet this is a natural phenomenon which must be accepted if confusion is to be avoided.

If on the original analysis there is a slight clue to a given hyperphoria, i.e., left hyperphoria, then the right (or opposite) eye should be occluded first. This is on the assumption that this patient will have more left hyperphoria than right hyperphoria. If the reverse should be true, then it will be necessary to occlude the first eye one more day to make the correct hyperphoria manifest before prism application.

For example: If one should occlude the right eye for three days, remove the bandage and measure 1Δ right hyperphoria; then occlude the left eye three days and measure 3Δ left hyperphoria, the total hyperphoria for this individual would be approximately 2Δ left hyperphoria and the first temporary prism would be calculated on this basis.

If, however, this patient had covered the left eye the first three days, and the right the second three days, then at the conclusion of the six-day period he would actually be manifesting 1Δ right hyperphoria, when in reality he is a 2Δ left hyperphore. Occluding the left eye for one more day would manifest the left hyperphoria once again so that the temporary prism could be applied.

On the first appointment, it is very important that the symptoms presented in the original history be reviewed. If the patient is keeping a headache diary, this should be asked for and checked. The patient should be questioned as to headaches during the three days. What was the intensity, frequency, and location? Was there any nausea or vomiting? Was there vertigo? Did the vision fade upon fixation? If there was marked insomnia prior to occlusion, was there any change during occlusion? Was cervical and trapezius tension increased or decreased? Was reading easier or more difficult? Was there a marked increase in nervousness?

After the history, the patient is instructed to close both eyes and keep them closed until instructed to open them. Even a short stimulus to fusion can alter the results obtained during the prolonged fusion-free period.

The bandage is removed, always starting on the nasal side and pulling slowly toward the temporal; the skin is pulled from the bandage and not the bandage from the skin. This lessens any irritation and pain. To reduce any chance for lid trauma, an eye bandage should not be jerked off quickly, as the patient sometimes has the bandage directly on the eyelid. The patient is given a soft facial tissue to wipe the eye and reduce the itching and discomfort.

Phoria and duction measurements are taken as soon as the eyes are centered in the phoropter by the corneal light reflex method. To lessen a fusional stimulus, it is advisable not to take horizontal ductions. It is also advisable at this time not to take subjective refractive findings as the occluded eye will be most inaccurate.

At the conclusion of the testing the patient's eyes are closed and the opposite eye bandaged. It is easier to have the room lights slightly dimmed when the eyes are opened, as the previously occluded eye has been dark-adapted for three days. It is also suggested the patient become oriented for awhile in the office before returning home, especially if vertigo appears.

At the conclusion of the next three days the above procedure is again repeated and the trial prisms then instituted. At this point it is necessary to explain the problem to the patient and give him detailed instructions for the following week. First, a caution that he may feel very upset for even a few hours after again obtaining binocular vision. Second, to be cautious in walking and going up or down steps. Third, he may notice altered stereopsis. A typical example is a warping of flat surfaces, i.e., table tops may appear convex instead of flat. This could persist even for two or three days, but will gradually subside. The patient is then instructed to wear the temporary prisms for one week, with strict instructions never to have binocular vision unless the correcting prism is before the eyes. He is told to shut the hyperphoric eye any time the glasses are removed. For bathing, a plastic eye shield with elastic band can be furnished if it is desired.

This use of monocular vision upon removal of the prism is of utmost importance as even ten minutes of binocular vision may induce a return of the original symptoms which could last up to 24 to 48 hours. As the symptomatology at the end of the week's trial period is of paramount importance, it should not be confused by attempting binocularity inducing the original stress syndrome. If at the end of the week's trial period the symptoms have not abated completely, and the phoria and duction measurements indicate a change in prism, this is made and the new prism worn for another week. At the conclusion of this seven days, the history is again carefully checked along with the phoric responses. Not until maximum relief can be obtained from trial prisms is a prescription written for a permanent lens correction. The details for prescribing post-occlusion prism will be handled in a subsequent paper.

EXTENDED TIME FACTOR

A recent refinement of the prolonged occlusion technique now being used with patients exhibiting a chronic severe syndrome which has persisted over many years in which the first post-occlusion result does not obtain complete relief is as follows:

When the phoria findings become stabilized at the end of at least the second or third week of trial prisms, a permanent prescription is made, even though some of the symptoms may persist. These lenses are worn for a period of two months. At that time the phorias and ductions are retaken and, if still stabilized, the hyperphoric eye is again occluded for a period of two days. If these post-occlusion results indicate a need for more prism, then trial prisms are again used

and if this in turn further alleviates the symptoms, a new lens prescription is made. In a few very persistent cases this technique has been utilized over a period of one or more years before complete results were seen. However, partial results were obtained even at the conclusion of the first occlusion period.

SUMMARY

Occluding one eye for a period of time is the only known method for finding a latent binocular deviation. The validity of the findings varies greatly depending upon the order of occlusion and the length of time involved.

For this reason, different investigators should reproduce findings with reasonable likeness if universal acceptance of this test is to be realized.

This detailed presentation of a standardized technique is presented to satisfy the following three requirements for a physical test:

1. The test must reveal information which is both comprehensive and useful.
2. It must cause only a reasonable amount of discomfort and time loss to the patient.
3. It should be readily duplicated by different investigators.

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