Henry Ford Hospital Medical Journal

Volume 5 | Number 1 Article 4

3-1957

Anomalous Retinal Correspondence: Diagnostic Tests And Therapy

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ANOMALOUS RETINAL CORRESPONDENCE: DIAGNOSTIC TESTS AND THERAPY*

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The subject of anomalous retinal correspondence has been presented by others, and it still remains an important factor in attempting to establish a cure in strabismic patients. It has been our experience to find a large number of patients with anomalous retinal correspondence who achieve normal correspondence with preoperative treatment, also a few with persistent anomalies of sensory adaptation postoperatively, who may or may not develop normal correspondence by orthoptic therapy.

Let us attempt to define normal retinal correspondence before going into the abnormal type of retinal correspondence:

Normal correspondence exists when two images falling on corresponding points of the two retinas have a common visual direction. Normal correspondence is an indication of normal sensory localization of images despite a motor anomaly.

The age of the patient and his adaptability, as well as the intensity and duration of the anomaly are to be considered in desiring a cure. Fusion with normal retinal correspondence and vergence control are indicative of postoperative binocularity of vision[1].

Anomalous retinal correspondence is manifested in two ways: (1) Localization in two different directions of stimuli received normally by corresponding elements, as the two foveas, and (2) localization in the same direction of stimuli received normally by non-corresponding retinal elements, as the fovea of the fixing eye and an extrafoveal area of the retina of the deviating eye.

In a normal situation the images perceived are falling on two foveas, so that fusion results. In strabismus, the image is received on the fovea of the fixing eye, but on a disparate or more peripheral point of the squinting eye. It is impossible to fuse, so the result is diplopia. Diplopia is undesired so suppression at the fovea results, and the next step is the development of anomalous retinal correspondence.

So anomalous correspondence becomes a means of adjustment or perhaps a close second to fusion. There must be some past expereince in binocular vision; otherwise diplopia could not be aroused.

Anomalous retinal correspondence is present in a high percentage of children with heterotropias developing early in infancy. It is less common in tropias becoming manifest after 3 years of age or in small angle deviations, say, 15 degrees or less.

Anomalous correspondence may exist in various conditions. It may be present when the usually dominant eye is fixing but absent when the other eye is forced to fix. In divergent strabismus with one eye fixing and the other divergent, it may be

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*Presented at the Fifteenth Annual Meeting of the American Association of Orthoptic Technicians, Palmer House, Chicago, Illinois, October 14, 1956.

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present, but with binocular fixation a normal retinal relationship may exist.[2]

Anomalous retinal correspondence is stimulated and strengthened by use and becomes unstable without use, indicating a need for monocular occlusion.

There are certain contraindications for preoperative orthoptics which we can mention here:

1. Those patients with large deviations, 20° or more.
2. Young patients in whom anomalous correspondence has not become established, as those with recent onset of squint.
3. Adults where cosmetic correction only is desired.

In a subject with normal retinal correspondence, the use of corresponding elements means single vision and the use of disparate elements creates double vision or diplopia. Anomalous retinal correspondence is said to exist in a person when elements of the two retinae which are disparate, such as the fovea of one eye and an extrafoveal area of the other eye, have a common visual direction. A patient with anomalous correspondence will see double when fixing with both foveas with the visual axes parellel, and single with the fovea of the fixing eye and an eccentric element of the other eye. This can be demonstrated by the amblyoscope. At the objective angle (the patient's angle of deviation, where any redress movement is no longer present), the patient will see double without being able to superimpose the targets presented to each fovea. However, at a lesser angle the patient may see a single superimposed picture of the two targets presented, using the fovea of one eye and an eccentric retinal area of the other eye. A comparison of the objective angle or relative position of the eyes, is made with the subjective or localizing angle, to measure the angle of anomaly.

In examining for diagnosis, in a case of concomitant strabismus the patient can be made aware of diplopia if the two fields are differentiated as by a colored filter. If the colored filter is placed in front of one eye while the patient is fixating a small light, the patient will see double — one colored and one white light. In an esotropia the displacement will be homonymous, and in exotropia, crossed, provided retinal correspondence is normal. Vertical displacement can be seen in accordance with any vertical anomaly; the amount of displacement should coincide with the deviation.

In a patient with anomalous correspondence, the localization will not agree with the position of the eyes. The subjective angle will be smaller than the objective, and the images may even be superimposed at zero; or the localization may be completely opposite, as for example, a patient with esotropia may show crossed diplopia, and a patient with exotropia may have uncrossed diplopia.

If the objective angle (motor anomaly) and the subjective angle (sensory anomaly) are equal, the patient is said to have harmonious abnormal correspondence. If the subjective angle is less than the objective, the patient is said to have unharmonious abnormal retinal correspondence. If there is crossed localization instead of uncrossed or vice versa, the diplopia is termed paradoxical.

On the amblyoscope the same conditions may be found. The arms of the instrument can be set at the patient's objective angle of squint. If the patient superimposes the targets at his objective angle, he has normal retinal correspondence. If he superimposes

at a lesser angle, he has abnormal retinal correspondence. The abnormal correspondence is said to be harmonious if the subjective angle is zero, and unharmonious if less than zero.

The state of retinal correspondence can be determined by the so-called after-image test. In this test, first one retina is exposed to a horizontally placed lighted filament. The bulb has a band or ring which bears a fixing dot and which conceals the filament. The patient is asked to fix on the dot for about ten seconds with one eye at a time: The tubular bulb is horizontal while one eye fixes and vertical while the other eye fixes, with the non-fixing eye always covered. After the exposures the patient will perceive an after-image of two straight lines with a hole or gap in the middle. The position of the lines will determine the visual directions of the foveas. If the lines coincide to form a cross, and the two dots coincide, the patient has normal correspondence. If the dots are displaced to the right or left, the patient has anomalous correspondence. The after-image test is an indication of the sensory relationship between the two eyes. A positive after-image suggests a deep-seated anomalous retinal correspondence and tends to suggest a poor prognosis.

Treatment of abnormal retinal correspondence is usually in three steps:

1. Occlusion
2. Major amblyoscope
3. Physiologic diplopia

Abnormal correspondence is a binocular condition with disparate retinal elements receiving the impression of a single object or image viewed. The fixating eye uses the fovea and has no suppression, but the squinting eye uses a more peripheral element and has suppression between the periphery and the fovea. Now, if fixation is switched, so is the suppression area.

The logical step is to occlude one eye constantly. It must be borne in mind that the angle of squint is not changed; that is, no motor change results, but the sensory pattern will be altered.

Occlusion is alternated if alternation is present or if amblyopia is absent. If amblyopia is present, naturally the better eye only is occluded until the vision becomes equal in the two eyes or within two lines of the Snellen chart. In this way as vision improves, the sensory pattern can be altered. Age and work have to be considered for psychological reasons. As soon as vision has improved, then the major amblyscope can be used under the technician's supervision only.

The methods we use on the amblyoscope, and we use a Lyle Mapor as well as the Troposcope, are alternate flashing at the patient's objective angle of squint, oscillating the instrument arms, and using the monocular diplopia routine (Walraven Technique). The arms of the amblyoscope are set at the patient's objective angle of squint. We start with larger targets and work to foveal sized targets. The lights are flashed alternately from one eye to the other. We increase the light intensity in front of the habitually non-fixing eye. The corneal reflexes are watched closely, as stimulus to accommodate may change the convergence angle and foveal fixation may be lost. The foveas thus are constantly being stimulated by light. Some of the instruments have

automatic flashing devices. I prefer to flash manually, since there is less chance of losing sight of corneal reflexes. The arms of the instruments are locked at the angle of squint, and a large side to side sweep is made within the angle of squint, watching again the corneal reflexes for any change due to accommodative effort. In addition, we have the patient fix with the fovea of the habitually squinting eye on a test target of foveal size while the other slide, a larger size, is gently moved over the other eye in an angle of about 20 degrees. This is quite often referred to as "massaging the macula". The side which is oscillating or "massaging," constantly invades the suppressing area in the anomalous region. The suppression area becomes smaller, and the targets seem to be moving closer to each other; then the arc of movement is reduced. When the patient is able to superimpose at his objective angle, the excursion is continued with alternate flashing again, until the pictures can be held fused for at least a count of fifty. This is then followed by some amplitude training: holding fused images while symmetrical convergence and divergence is exercised. The technician utilizes the method which she feels is most suitable for the particular patient at hand. Some patient's respond favorably in a short time, others take a longer time. We feel that after six or even ten sessions (rarely more than six), and after amblyopia has improved, surgery is indicated. Then we resume postoperative therapy, if indicated, the same as preoperative.[3]

The procedures for treatment as here mentioned are not necessarily applicable to all patients with anomalous retinal correspondence. There are certain patients who, despite almost perfect alignment of visual axes by surgery, never gain a clear bifoveal fixing pattern. They eventually start suppressing again and do not have binocular vision although preoperative treatment was given.

Patients must be "picked" for therapy. Age, attention-giving ability, and attendance in the office are to be considered. Cooperation from, and understanding of parents as to what is desired is essential in selection of patients for therapy. When a child is brought into the office for treatment of crossed eyes, and we institute exercise, patching, and glasses before surgery, parents must have some knowledge of what we are doing and why. Then, after surgery, again the parents may question and rightfully so, the effects of prolonged treatment. The orthoptist must be prepared to inform them and reasonably answer their queries. In this role, the orthoptist must realize her limitations, and not assume the responsibilities of the ophthalmologist.

SUMMARY

In strabismus, normal retinal correspondence represents bifoveal fixation at the objective angle of squit. Abnormal retinal correspondence represents a perverted sensory adaptation to a motor anomaly.

Diagnostic tests of dissociation by colored filters, after-image test, and major amblyoscope are described.

Treatment by occlusion, amblyoscope and diplopia are described.

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