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Retinoscopy

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Optometry is a unique profession. One thing that makes optometry unique is how we use light to gain insights into both the potential and actual behaviors of a human being. It has been said that the ultimate tool that the optometrist possesses is their power of observation; their own visual abilities. Over the more than 100 years of the development of optometry as a unique profession the retinoscope has been a tool that has greatly aided gaining insights into the behavior of the patient.

The retinoscope has been used in two basic ways. The first has been as an aid in the derivation of the distance refractive condition. This use of retinoscopes is well chronicled in the literature and is not going to be addressed in this paper. The second has been the most fruitful and includes all uses of the retinoscope that go beyond the goal of the derivation of a distance lens formula.

A number of techniques for using a retinoscope have been developed. Each of these seems to be associated with a different optometric pioneer who had the idea or insight that helped to bring that use of the retinoscope to the fore. It is important to note that there is no one right way to use a retinoscope and that none of these techniques is thought to be better or worse than another. Each seems to lend itself to being used to answer slightly different questions about the patients' potential and actual behaviors. Under different circumstances with the same patient different retinoscopy techniques might give more clinically significant insights. The same specific retinoscopy technique may give clinically significant insights to varying degrees across a number of patients. Thus, it is advised that optometrists should familiarize themselves with a variety of methods of using the retinoscope and to practice each on a number of patients to become facile enough in using the technique so that it is available when needed.

Some of the more popular retinoscopy techniques that will be touched on are:

- Book (Getman)
- Bell (Apell)
- Dynamic (#5 & #6 OEP)
- MEM (Haynes)

- Stress Point (Harmon & Kraskin)

Each of these types of retinoscopy will be discussed briefly so that the reader has some idea as to what is unique about each of the techniques.

What kind of Retinoscope

There are two types of retinoscopes; the spot and the streak. Either kind of retinoscope can be used to perform the dynamic retinoscopy techniques mentioned in this paper. The streak instrument has both a converging and a plano mode. It should be used in the plano mode for these types of dynamic retinoscopy. The spot only has a plano mode so no adjustment is needed.

When a streak is used in the plano mode, it is basically a spot with the sides cut off. The streak retinoscope has less illumination and the optical phenomena that take place away from the center of the streak are obscured. It will be more difficult to observe changes in cylinder or subtle changes in color, or brightness. Generally there is more information available with the spot instrument.

Book Retinoscopy

Book retinoscopy is a technique developed at the Gesell Institute. Dr Gerry Getman was one of the originators and its chief promoter. In the pioneer work with Arnold Gesell, MD, it was noted that the retinoscopy reflex changed based upon the level of involvement or interaction a child has with what they were looking at.
For the actual procedure a series of graded reading paragraphs on cards were clipped to the retinoscope. The examiner looked just over the top of the card to stay as close to "on visual axis" as possible while the child read. This was done at the child's habitual near working distance.

They found the following responses:

1. At the **Free and Easy** reading level, the reflex varied from neutral to with motion and was bright, had sharp edges and had a pinkish color.
2. At the **instructional** reading level (which was defined as maintaining the reading task with comprehension in spite of being stressed) the reflex was a varying fast against motion while the color was bright, sharp, and very pink.
3. At the **frustration** reading level (which was defined as reading with minimal comprehension) the reflex showed a slow against motion with a dull brick red color.

This form of retinoscopy was considered an improvement over standard retinoscopy of the day (#5) because the target and the task were similar to what the child actually encounters in their daily activity. It was historical in its time because it noted that decoding and comprehension (cognition) changed the retinoscopic reflex. Lenses could also be used to see if the response could be altered.

Bell Retinoscopy

This procedure was named for a small shiny bell dangling from a string that was used as a fixation target. In practice, the bell has generally been replaced with a Wolff wand (a shiny, gold or silver, ½ inch diameter, metal ball mounted on the end of a rod). The wand is held by the examiner so that the ball is at the patient's eye level and midway between the two eyes. The ball will be moved closer to and farther from the patient along this midline. The retinoscope is positioned slightly above this line at a fixed distance of 50 cm. (20 inches) from the patient.

Begin with the target directly in front of the retinoscope. Have the patient fixate the target and note the movement of the reflex with slight movements of the retinoscope. Move the ball toward the patient slowly and smoothly, and note changes in the reflex. Bell retinoscopy has focused primarily on the motion of the reflex, but color and brightness changes can also be observed. The distance of the target from the patient is recorded for a change in motion or other changes of interest.

With a hyperopic patient or a person wearing compensatory lenses which match the distance refractive status we expect to see a "with" motion as we begin Bell Retinoscopy. As we move the target closer to the patient there will be a point where the motion changes from "with" to "against." Continue moving the target closer to the patient another three to five cm. (1 - 2 inches) and then start moving the target away from the patient. The "against" motion should switch back to "with" motion at some point.

To understand the changes consider conceptually what is happening. We are essentially measuring the lag of accommodation as a linear measurement rather than with lenses. The distance between the retinoscope and the target when the change in motion occurs is a physical measure of the lag of accommodation. Typically we expect to see a change from "with" to "against" on the way in at 35 - 42 cm. (14 - 17inches) and a change from "against" to with at 37.5 - 45 cm. (15 -18 inches).

If the lag of accommodation does not fall within these ranges, the procedure is repeated with plus lenses. Lenses which normalize these ranges are considered an acceptable nearpoint prescription. Performing the procedure separately for each eye can suggest a different anisometropia for near prescription purposes. Cylinder axes can also be tested separately to determine a different near cylinder prescription. Do not assume that a lens calculated from the Bell Retinoscopy measurements will have the desired effect. We suggest actually repeating the test with the suggested add (or new aniso or cylinder) in place.

Dynamic Retinoscopy at 20" (Skeffington #5)

This technique usually starts with the distance retinoscopy (#4) in place. It is done with the patient behind the phoropter and the examiner's retinoscope at a 20 (twenty) inch distance from the patient. The patient is asked to fixate small letters or a picture, which are placed at the plane of the retinoscope. Targets are available that clip onto the retinoscope for this test. The patient is asked to look, read, name, and interact visually with the target to insure fixation.

Plus spheres are added until against motion is seen. Then the plus spheres are reduced (or minus increased) until the first neutral (no motion) response is obtained (high neutral). The lens in the phoropter is recorded as the "gross" finding. Astigmatic differences were not mentioned in the "black book" explanation of this retinoscopy.

The #5 retinoscopy, like the other "21 point findings", had no specific meaning by itself until it was compared to other findings as part of the total analytical examination. In many cases, the #5, like the 14B gross, will approximate the most plus lens acceptable for near.

MEM Retinoscopy

MEM stands for **M**onocular **E**stimate **M**ethod. MEM retinoscopy is a near retinoscopy technique that is done differently from any other. Most near retinoscopy depends on the insertion of a lens to determine the effect of the lens on performance. MEM is unique in that lenses are primarily used to verify the observation of the doctor. MEM depends on a careful evaluation of the movement of the retinoscopy reflex to understand the response of the person to a combination of target and activity. Although color and brightness changes will be apparent to the majority of observers, Harold Haynes, the originator of the technique, discounted the importance of these observations as a part of this technique.

In general, the patient is asked to look at a near stimulus while the observer watches the retinoscopic reflex from the plane of the stimulus. In most cases, there will be a "with" reflex corresponding to accommodation postured farther from the patient than the stimulus. The amount of the "lag of accommodation" is the amount of plus lens corresponding to the movement seen. A key here is that the amount of lens is estimated based on the amount of movement observed. If the examiner desires, a suitable trial lens may be inserted briefly in front of one eye to verify the amount of movement, taking care that the lens changes performance as little as possible. The lens is only inserted to verify the optical information—to help quantify the amount of with movement observed and only if needed.

In general, patients will show with motion. It is relatively easy to develop confidence and accuracy in estimating the amount of with motion seen and the use of a lens is not usually necessary. In the less common event of against motion or "a negative lag", it is very difficult to accurately estimate the lens corresponding to the movement of the reflex, even for a veteran observer.

In many cases the target stimulus is presented in contact with the front of the retinoscope as a card with an opening in the center. The observer looks through the hole in the card and so is very close to "on axis" with the patient. It is easy to observe changes in the reflex as the patient looks at targets of differing sizes or increased intellectual demand. In general a patient will posture accommodation closer to the plane and show less with motion with a smaller target or with increased intellectual demand. Some patients will actually move from with to against motion if sufficiently challenged. If a patient goes into flight or loses contact with the target, the lag may be much greater than otherwise expected.

An alternative way to use MEM retinoscopy is to watch the changes that occur while a person is reading. *(See book retinoscopy above)* In that case it is often more practical to watch the changes in reflex from above the reading passage. Graded reading cards can help illustrate the changes in visual posture as the reading material becomes more challenging or involving.

Any of these activities can be repeated through proposed lens prescriptions to help find the lenses that promote the most effective match between posture and demand.

Stress Point Retinoscopy

This technique grew out of a series of observations made by Darell Boyd Harmon while working with Robert A. Kraskin looking at changes seen with a spot retinoscope used at the patients' Harmon distance. Unlike nearly all other retinoscopy techniques here the scope was not moved but was held stationary, centered in the exit pupil of the patients' eye. A target was moved toward the patient and changes in luminance, (some claim color variations as well although as luminance changes the color temperature of the light will change) are observed as the target is moved towards the patient. The technique is done with the patients' habitual prescription in place in free space. The patient is asked to look at a Wolff wand held, at first, directly above the retinoscope.

With the wand at the patients' Harmon distance with their habitual prescription in place the reflex should be relatively bright. This represents a state of active "computing" where the patient is engaged with the target. Centering and Identification and visual attention include the target. The patient can be described as being in "fight" on the fight-flight continuum. The visual system is engaged.

As the wand is brought towards the patient one can think of their being a zone inside of the patients' Harmon distance, between the examiner and the patient, where as the target is brought closer, the patient changes how they are looking to continue to remain engaged with the target. In different patients this is done in different ways and it is beyond the scope of this brief introduction to explain what the person does in detail. For example, some may show outward signs of increased effort, some may only show a shift in the vergence position of the eyes with little or no other observable shifts, some may show pupil changes, and some may show heart rate or blood pressure changes. What remains constant is that there is a period that the visual process remains on or actively processing perceptually from the lit world in front of them. During this "on" or "engaged" phase the reflex remains bright, although there may be a slight sense of increased brightness the closer the target is prior to reaching the stress point.

At a certain point between the examiner and the patient a change occurs in the reflex. This is a point at which the visual process apparently shifts from fight to flight, from engaged to standby, from on to off, from spatial computing to preservation of self. Harmon described a momentary massive brightening followed by a significant decrease in luminance at this threshold is crossed as the target is moved towards the patient. Thus, instead of looking for a kind of optical phenomena, what this technique is doing is helping the optometrist gain insight into this fight-flight, on-off, etc. continuum in the patient and can help the optometrist understand much about how the patient approaches visual tasks as well as challenges in life.

What Harmon and Kraskin also found was that lenses could change the location in space where the patient made the shift from fight to flight. Extremely low powered convex lenses over the patients' habitual shifted the stress point towards to patient, increased the volume of space within which the patient could remain in fight. Kraskin popularized this procedure in his series, "Lens Power in Action" first published by OEP 1982-83 and re-released in 2003.

Many people have found his procedure difficult to work with as the luminance changes, which experienced users see as large, appear as small or are not even seen by newcomers to the technique. Harris has modified the procedure to help in identifying the maximum plus that could be accepted in cases where maximum plus at near is desired. In cases where the patient has excellent visual abilities that are embedded and which the patient wishes to use for longer periods of time more efficiently, the Kraskin/Harmon method yields the optimum lens.