Viewpoint: What is a Refraction?

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As a rose is a rose is a rose, the term refraction has multiple meaning. In an academic setting, students are taught the art of refraction by many different instructors from the classroom to the clinic. They assimilate this knowledge and create their own versions of the definition. Most fourth year students understand refraction from a short sighted perspective, which just includes visual acuity, retinoscopy, and a subjective. In simple terms, it is all about the patient's prescription.

As optometry has evolved from an eyeglass oriented to a fee for service profession, we have seen the status of refraction diminish in the eyes of many practitioners. The medical model has never grasped the art of refraction. They have limited training in this area and have delegated this responsibility to technicians. Many patients' visual needs have been compromised by this superficial perspective. Many ophthalmologists still rely on plus cylinder prescriptions and have minimal concern regarding the concept of refraction. They believe that if a patient is uncomfortable with their prescription, it is only a matter of time for them to adjust to their glasses. In truth, some patients will adjust over time to any prescription while others will simply get another opinion.

The greatest injustice to the well-being of patients of all ages by a flawed medical model has been the extensive use of cycloplegic agents. For some unknown reason, cycloplegia has become an essential part of the refraction process in order to determine a patient's appropriate refractive correction.[1] Some practitioners believe that it is crucial to establish the patient's true refractive error. In certain cases, cycloplegia can be an invaluable technique, but it is not indicated in every evaluation. The concept of paralyzing an organ in order to assess its functionality is illogical. In other words, we should be doing medical examinations under general anesthesia if this premise has a sound basis. Another major concern has been that this antiquated approach has been strictly focused on our ability to see a Snellen letter or equivalent at distance, which is only one part of our day to day visual functioning. Refractive status is a dynamic process and emmetropization has an important impact on this process.

The art of refraction is more comprehensive than a few limited tests. Our patient's complaints are an important part of determining their overall visual needs. Is their complaint related to distance blur or a nearpoint dysfunction? In a society which has seen an epidemic of myopia, it is easy to consider any complaint of blur as a strong indicator of myopia. In a busy practice, in a short evaluation, which is limited to acuity, autorefraction, subjective, and eye health assessment, the disposition will often lead to the prescribing of minus for myopia. A lingering question is whether we are dealing with myopia, pseudomyopia, and/or an underlying binocular and accommodative dysfunction. We certainly know that prescribing a minus lens is rarely rejected by most patients. It is rare for a patient to react negatively to another quarter of a diopter of minus during the subjective. In many cases, you can over-minus a patient by one half to three quarters of a diopter without a negative reaction. Minus has an addictive impact on many myopes and should be used judiciously. It is also counterintuitive to be prescribing a myopic prescription for a patient who has nearpoint complaints. In many of these cases, a myopic shift may be an adaptation to the patient's nearpoint dysfunction rather than the development of or an increase in myopia.

The state of myopic research is in disarray. We have seen studies, which have indiscriminately recommended an add of two diopters to retard the progression of myopia.[2,3] This add has been prescribed without any consideration as to the patient's nearpoint phoria. A recent study prescribed a four base-in prism in an executive bifocal with a +1.50 add with positive results. There was no concern regarding the patient's binocular status.[4] Current thoughts regarding myopia control range from spending more time outdoors to managing the peripheral retina with either drops or different lens designs in spectacles or contact lenses.[4-6] The key issue is that there are different subgroups of myopes. A preschooler with four diopters of myopia is obviously not in the same category as a college student who becomes myopic in her freshman year. There is no question in my mind that hereditary and environmental factors are part of the equation, but it is not a one to one relationship.

Hyperopia is a common refractive condition which is becoming less common in our near oriented world. It has been clearly noted that hyperopia is considered a normal state in infants, which gradually decreases over time, and then increases with the development of presbyopia. Ironically, with hyperopia it is very important to look beyond the patient's acuity and refractive error. From a clinical perspective, the management of hyperopia will require an in-depth assessment of the patient's binocular and accommodative status. If a patient has convergence excess or accommodative esotropia, the treatment options will be different than if the patient has normal binocular and accommodative status with excellent stereopsis. Symptoms can potentially alter our lens alternatives but aggressive prescribing for hyperopia is not always the proper solution. In clinical practice, we often see a natural ebb and flow in hyperopia. The inappropriate application of glasses may alter the process of emmetropization.

After myopia and hyperopia, we have the most common of all refractive conditions, astigmatism. The general public is often ignorant of this condition except in extreme degrees. It is not part of the common vernacular of nearsightedness versus farsightedness. Because astigmatism is difficult to describe, some practitioners avoid the term. On the other hand, an attempt to portray significant astigmatism as eye balls which look like footballs is totally inappropriate. This picture creates a lot of stress for any parent attempting to understand their child's actual visual condition. The truism about astigmatism is that almost every patient has some degree of astigmatism. The question is whether the astigmatism is clinically significant. For some practitioners, a quarter of diopter is important regardless of orientation. In some instances, the prescribing of an astigmatic correction may be a refractive solution for an underlying binocular/accommodative dysfunction. Small degrees of against-the-rule or even with-the-rule astigmatism may also indicate a potential accommodative problem versus a real refractive error. Key prescribing variables will include the impact on the patient's acuity as well as the patient's age. Children can deal with small amounts of uncorrected astigmatism, while our geriatric patients may find small degrees of astigmatism problematic. Another specific concern is understanding the importance of prescribing astigmatism in a

symmetrical versus an asymmetrical manner. Since humans are basically symmetrical, our astigmatic correction should reflect this orientation. The auto refractor, which is technologys' equivalent of the retinoscope, is both a positive and negative addition to our testing protocols. In many instances, it is a helpful guide, but it can also be very inaccurate. Astigmatism has defied logic because it is not easy to incorporate into research projects. The spherical equivalent has been developed to deal with this discrepancy, which has distorted the actual incidence of astigmatism in the general population. Beyond the common refractive errors, we have some outliers, which cause functional distortions. From anisometropia to antimetropia, we have the establishment of an atypical adaptation or a genetic variant. An appropriate eye exam, which considers the patient's initial visual complaints, overall visual status, and visual needs, will determine the correct lens prescription and/or proper optometric intervention at both distance and near. A simple spherical prescription from +1.00 to +2.50 OU will not resolve every patient's visual problems with these types of refractive conditions.

The subjective is another probe into a patient's preferred mode of functioning. It is not simply about the numbers, although some practitioners can be over-fixated on data collection; patients have a different perspective. A hyperope may reject a lens prescription because the world appears too large. A myope may respond negatively to the size change. Some patients will even prefer to function in a blurred environment. From a professional perspective, we have been over-focused on the distance subjective. We even promote a binocular balance without any knowledge of the patient's actual binocular status. The Jackson cross cylinder is another artificial probe into the realm of unknown. Patients are often very concerned regarding their decision making on the subjective. The concept of "which is better, one or two?" creates a high level of anxiety for many patients and has a questionable impact on the final prescription. With-the-rule astigmatics will characteristically reject moderate degrees of astigmatism while other patients will accept astigmatism at a strange or inappropriate axis. One patient, six weeks after the refraction, called to report that "one was really better than two!" In asking her about her glasses, she was very satisfied, but she was still obviously concerned about her response on the day of the refraction.

From a teaching perspective, students spend an inordinate amount of time on the patient's distance prescription. They are encouraged to push maximum plus in their final correction. In many instances, the patient's distance prescription will be plano and the patient may ultimately only be prescribed a near prescription. In view of this scenario, the question is why do we not do a near subjective. In my 25 years of part time private practice, I found that a nearpoint subjective was an integral part of my visual exam. It was a simple procedure which can be strategically placed as part of the near-point analysis. After performing a fused cross cylinder, a quick subjective helped determine an appropriate nearpoint prescription. It also led directly to an AC/A ratio and NRA/PRA assessment. A nearpoint subjective allows the practitioner to assess the patient's overall response to plus and determine if a difference exists between +0.75, +1.00, or +1.25 or if all of these lenses elicit the same response. In the latter situation, a plus lens or add is probably counter-indicated.

Another invaluable tool in determining a patient's prescription is nearpoint retinoscopy. Although all optometric students have been taught various techniques from MEM to book retinoscopy in lectures and in labs, they rarely use these methods in a clinical setting. With our current over emphasis on correcting a patient's distance refractive error as the solution for all of their visual problems at all distances, it is time to revisit the importance of nearpoint retinoscopy as part of our diagnostic battery. In the October issue of *Ophthalmology Times*, Burton Kushner, MD stated "Dynamic retinoscopy is a useful, yet underutilized test that assesses accommodation in real-life situations and it can help to correct hyperopia."[8] Hopefully, optometry will begin to see the value of this useful probe.

Any lens prescription must be assessed outside of the phoropter. Because a phoropter minimizes a patient's peripheral vision, it is possible for a patient to accept more plus in their prescription. Outside of the confines of a phoropter, they could be uncomfortable with the proposed prescription. The patient should be aware of the positive value of a nearpoint prescription and be willing to wear this prescription, especially in the case of a child. Some children may reject glasses for psychological reasons. In this case, you may want to have the child adapt to their glasses at home before recommending that they wear their lenses in the classroom. Any change in a patient's prescription should require a comparison between the old and the new prescriptions. In some instances, the patient will prefer their previous lens prescription. Lenses for computers also create a host of different prescribing concerns for doctors and their patients.

In the final analysis, refraction is more than acuity, more than retinoscopy (wet and/or dry), and more than a subjective. It is ultimately the entire exam from the case history to the refraction to the visual skills profile to the individual patient's visual needs. It is also critical that the practitioner be aware of the patient's positive or negative response to a lens prescription. Although we have been taught the power of lenses, it is important that we are aware of the negative impact of prescribing. Glasses may in certain instances exacerbate a visual condition. In other words, the lenses create more symptoms without addressing the patient's primary problem. The inappropriate use of plus lenses in convergence insufficiency and in myopia control may actually do more harm than good. The over-minusing of a divergence excess patient or the over-correcting of an esotrope may lead to other complications versus a resolution of the underlying visual deficit. A true refraction is always based on more than numbers. It is an understanding of patients, their visual status, and their visual needs. It is about communicating the appropriate lens prescription and/or appropriate optometric therapy. Hopefully, as we enter another phase of our optometric evolution, we will not loss contact with our past, refraction.

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