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New York State Continuing Education Mail-In Course

Today's Progressive Lenses

By Candace O'Keefe, Shamir Insights

As a dispenser in this generation, we find ourselves inundated with technical buzzwords surrounding the subject of progressive addition lenses (PALs). With well over 100 progressive designs in the market today it is more difficult than ever to decide upon the best lens for our patient's growing needs. How do we take the guesswork out of progressive selection and still offer the latest design techniques for our clients? We need to sort through commonly used technical terms, and separate the *fact* from *fluff*.

We know that lens design is a series of mathematical formulae. With advances in computer technology, we have the capabilities to create a design more effectively. We can now further the process with the development of software programs that simulate the human eye and its natural behaviors. Shamir Insight, Inc. introduced and patented Shamir's "Eye-Point Technology"™ in 1997. This advanced ray-tracing program helps scientists create the best optical solution based on known patterns of the human eye through its rotations and visual angles. With this information, the lens designer can manipulate the contour plot to eliminate problematic peripheral distortion.

There are many optical terms used today that help the dispenser differentiate between lens parameters. However, with the numbers increasing in design technologies come more and more industry terminology. This begins to cause some confusion. We need to cut through the fluff and get to the science, beginning with the phrases *hard* and *soft*.

A hard progressive lens design will have a high dioptric value of peripheral distortion. Intermediate zones are generally narrower with marginal



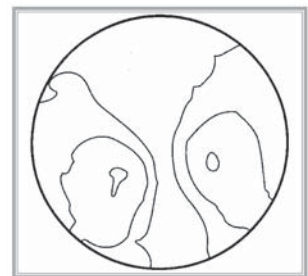
Hard Design

This course is worth one (1) New York State Continuing Education Credit, basic-level, Ophthalmic Dispensing credit.

astigmatism climbing swiftly along the periphery. The incremental power changes in the intermediate zone will increase more rapidly in a smaller area. Excessive cylinder in the progressive zone with a ratio of 2:1 is considered a hard design. For example, sphere based designs with an add power of 2.00 will have 4.00 diopters of induced cylinder power. Although the distance and near zones can be wider, unwanted cylinder power is much greater. The result being, adaptation time for your patients will be longer in a hard progressive design.

Softer lens designs will have a lower dioptric value of peripheral distortion. The ratio is now 1:1 or better.

The unwanted cylinder power in the progressive zone is generally less than the add power providing a much shorter adaptation period for your patient. The intermediate zone offers a wider viewing area with the power gradually changing over a larger area with less distinction between the



Soft Design

intermediate and near zones. Surface power contour plots are useful in demonstrating hard vs. soft design. I like to describe a PAL contour plot as a roadmap of the lens. Excessive cylinder increases as the curvature steepens. These power increments in specific areas will appear raised much like hills and lakes will appear on lower and higher elevations of a map. Caveat: manufacturers may choose different

dioptric values when comparing distortion. Half diopter power increments are generally used when demonstrating the amount of marginal astigmatism found in a specific design. Although lens contour plots can be a helpful analyzing tool concerning lens design comparisons, let's be sure we are comparing apples to apples.

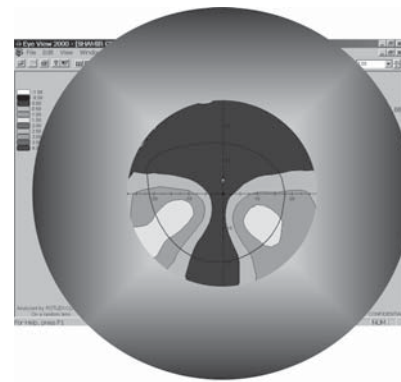
Another misconception/buzz phrase is in reference to *minimum recommended fitting heights*. If you were preparing for a national exam, like the ABO for example, you would memorize a specific number pertaining to the recommended fitting height of a progressive lens. With today's technology, we can now fit our patients to virtually any frame dimension, both large and small, thanks to the development of lens designs in short and full corridor lengths. Measuring the corridor length will be helpful in finding the actual fitting height for which the lens was designed. The corridor length is measured from the prism reference point (generally 4mm below the fitting cross) to the top of the full add power. In order to achieve a full reading zone, the add needs to be 5mm in depth. For example, a corridor measuring eleven millimeters in length is designed with a minimum recommended fitting height of sixteen millimeters. A corridor length of fourteen millimeters will accommodate a minimum height of nineteen millimeters, and so on. While fashion demands are creating the need for short corridor progressive designs, there continues to be a need for stable optics. Designs with corridor lengths below 10mm greatly increases the unwanted astigmatism induced. This change happens at an increased rate per millimeter. Use your best judgment in deciding whether the chosen frame is compromising visual acuity when measuring fitting heights for your patients. Keep in mind their lifestyles and intermediate needs when deciding, "How low is too low"! Choose a progressive lens designed with the characteristics specific to the demands of today's trendy frame shapes. The choice is now easier than ever to match lifestyle and fashion without compromising visual acuity.

We often hear the term *symmetrical* and *asymmetrical* in regard to lens design. Early progressive lenses were symmetrically designed so that the right and left lenses were identical. The inset of the corridor was achieved by rotating a lens nasally and marking it as right or left. As the wearer gazed laterally across the lens, binocular vision was disrupted due to the astigmatism difference between the nasal and temporal sides. This *symmetrical* design did not mirror the natural path of the eye's convergence, which is downward and inward. The result being, unwanted distortion primarily in the upper nasal zone. *Asymmetrical* lens designs custom create a right and left mold which take into consideration the prescription, base curve and add power. The amount of astigmatic

error on either side of the corridor can now be adjusted independently. The result is balanced vision as the eyes rotate back and forth, along the 180-degree meridian. Most modern lens designs today are asymmetrical in nature.

What happens to the reading zone width as the power of the add increases? In earlier PAL designs, the inset of the near zone was generally placed at 2.5mm. This early standard did not always allow a clear pathway for the eye's natural convergence. Research studies through Eye-Point Technology™ have shown that an emerging presbyope with a lower add power may converge as little as one millimeter per eye when viewing at near. As presbyopia reaches a more advanced stage, the eye's convergence is much greater. This is naturally due to the aging eye's lack of accommodation and need for more light. Patients experiencing the symptoms of advanced presbyopia will need to bring objects closer to the eye, thus converging as much as four millimeters per eye. Shifting the near zone of the progressive design inward as the add power increases will serve two benefits. 1.) Both the emerging and the advanced presbyopes will achieve the proper inset for their convergence needs. 2.) The reading zone will remain the same width as the add power increases as opposed to a single inset whereas the near zone decreases as the add power increases. This technical advancement in design is referred to as *Variable Insetting* of the near zone.

Although symmetrical and asymmetrical are terms used in describing the lens design, the term *horizontal symmetry* pertains to the placement of the excessive cylinder power created during the design process. As we know, it is mathematically impossible to create a progressive design without inducing some cylinder power as the



curvature changes down the progressive channel and into the near zone. Although lens designers cannot completely control the amount of induced cylinder, they can in fact, control the placement of this unwanted marginal astigmatism in the progressive zone. For instance, if all of the excessive cylinder were to be placed in the nasal portion of the lens, it would affect the wearer much like the earlier symmetrical designs resulting from the astigmatic difference as the wearer gazes from left to right. Placing this astigmatic error equally and horizontally

on both sides of the corridor will create a balance in the distortion experienced while the eyes rotate laterally across these zones. Although the image may appear blurred, with horizontal symmetry each eye will view the image equally and independently.

When referring to specialty progressive lenses we frequently use the term *computer lenses*. Do not let the name fool you. While functional for computer use, additionally, this soft lens design is ideal for our emerging presbyopes, post lasik clients and those spending many hours in a closed environment such as hairstylists, mechanics, physicians and engineers. While a reading lens will provide optimal vision at a fixed distance, these near and mid-range variable lenses are specifically designed to allow clear, distortion free vision at ranges covering 13 feet or less. Because the full distance acuity is sacrificed at 20 feet, these lenses are created with very little curvature change, thus minimizing any induced cylinder otherwise created in conventional progressive designs. In most cases, cylindrical error will not exceed more than a half of a diopter. This low ratio will allow for edge-to-edge clarity in all viewing zones. This makes adaptation virtually instantaneous to the wearer. Unlike conventional bifocals or progressives, these duty specific designs allow for comfortable vision while maintaining proper head/neck posture.

One of the latest advancements in ophthalmic lenses

is *Atoric* lens design. This new computer-based technology greatly enhances field of view and visual clarity through mathematical back surface plots. Prior to back surface atoric technology, lens designers used front surface aspheric curves to eliminate unwanted marginal astigmatism. Although aspheric technology is a significant advancement, it does have its optical limitations. Lens manufacturers can optimize either the sphere meridian, cylinder meridian, or a combination of both, but cannot maximize the entire lens in all meridians. Atoric technology counter-acts the front surface spherical aberration with back surface curvature. The mathematically plotted back curves minimize aberrations in every meridian. This could be thought of as back surface aspheric, but is really much more. Back surface optics is quickly becoming the future of lens technology worldwide.

As computer technology advances, progressive lens designs will continue to improve. Take the time to familiarize yourself with today's current technologies. Ask questions to your laboratory and lens reps. Attend educational seminars on a regular basis (whether you are required to do so or not). Flex your optical muscles by researching the facts and sifting through the fluff. Now is certainly an exciting time for optical professionals. With our industry offering so many advancements, we can provide the best optical solutions for our patients' visual needs.

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Today's Progressive Lenses

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and return to: NYSSO, 90 State Street, Suite 1009, Albany 12207 • fax (518) 463-8656**

Name: _____ License #: _____

Mailing Address _____

NYSSO Member: Yes No **If no, the registration fee is \$30.00; please complete the section below or the membership application on the reverse side:**

Method of Payment: Check (payable to NYSSO) Credit Card (please complete section below):

Type of Credit Card: Visa Mastercard Dollar Amount _____

Expiration Date: _____ Card #: _____ Signature: _____

1. The corridor length of a progressive lens is measured from the _____ to the top of the full add power.
 - a. prism reference point
 - b. dioptic center
 - c. mean reference point
 - d. geometric center
2. Softer design progressive lenses have a _____ dioptric value of peripheral distortion.
 - a. higher
 - b. positive
 - c. lower
 - d. negative
3. Excessive cylinder in the progressive zone with a dioptric ratio of 2:1 is considered a _____.
 - a. soft design
 - b. hard design
 - c. intermediate design
 - d. symmetrical design
4. As presbyopia reaches advanced stages, the eye's _____ becomes greater.
 - a. accommodation
 - b. illumination
 - c. convergence
 - d. variation
5. Which of the following is true for a hard progressive lens design?
 - a. Less cylinder is present in the periphery
 - b. The intermediate zone is longer
 - c. Patient adaptation time is usually shorter
 - d. None of the above
6. In order to achieve a full reading zone, the add must be _____ mm in depth.
 - a. 1
 - b. 5
 - c. 10
 - d. 16
7. The natural path of the eye's convergence is?
 - a. Upward and lateral
 - b. Downward and lateral
 - c. Downward and inward
 - d. Upward and inward
8. Which of the following is true of computer lenses?
 - a. Designed for a range of 13 feet or less
 - b. Soft design
 - c. Minimize induced cylinder
 - d. All of the above
9. A corridor measuring twelve millimeters in length will accommodate a minimum height of _____ mm.
 - a. 6
 - b. 10
 - c. 15
 - d. 17
10. Which of the following is true about Atoric lens designs?
 - a. Enhances field of view
 - b. Front surface curvature is used to counteract front surface spherical aberration
 - c. Hard design
 - d. None of the above
11. The minimum recommended fitting height is:
 - a. 16 millimeters
 - b. 5mm above the prism reference point
 - c. only used with short corridor designs
 - d. none of the above
12. Today's progressive lens designs are _____ in nature.
 - a. lateral
 - b. asymmetrical
 - c. horizontal
 - d. presbyopic
13. It is mathematically _____ to create a progressive design without inducing some cylinder power.
 - a. possible
 - b. probable
 - c. impossible
 - d. optimal
14. Asymmetrical lens designs create a right and left mold which take into consideration the prescription, base curve, and _____.
 - a. induced cylinder
 - b. lens thickness
 - c. add power
 - d. prism reference point
15. Horizontal symmetry pertains to the placement of the _____ cylinder power created during the design process.
 - a. excessive
 - b. required
 - c. spherical
 - d. custom

Membership Application

INDIVIDUAL'S NAME _____ COMPANY _____
 HOME ADDRESS _____ FAX # _____
 BUSINESS ADDRESS _____ EMAIL ADDRESS _____
 PHONE (HOME) _____ PHONE (BUSINESS) _____

Preferred Address: Home Business Preferred Phone: Home Business

Membership Type: Active (\$150.00) Newly Licensed-Active (\$75.00) Associate (\$75.00)
 (see below for category descriptions) Corporate (\$150.00) Student (~~\$150.00~~) *Waived for current membership year*

Method of Payment: Check (payable to NYSSO) Credit Card (please complete section below)



Type of Credit Card: Visa Mastercard Dollar Amount: _____

Expiration Date: _____ Card #: _____ Signature: _____ 02/05

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\$25.00 \$50.00 \$75.00 \$100.00 Other _____

Membership Year is September 1-August 31.

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To be listed accurately in the NYSSO Membership Directory, please indicate which of the following services are offered by your business:

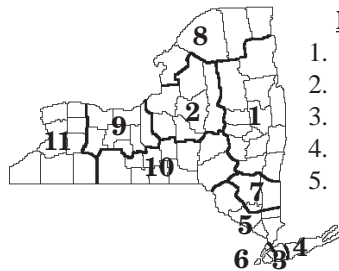
- Artificial Eyes Contact Lenses
- Eyeglasses Refractions Available
- Hearing Aids Low Vision

Please Complete the Following:

Chapter (see map) _____ Date of Birth: ____/____/____
 NYS License # _____ Sex: Male Female
 Contact Lens Fitter # _____ Signature _____
 Sponsor (if applicable): _____ Date _____

Please indicate to which organizations you belong:

- American Board of Opticianry Certified (ABO)
- Fellow, National Academy of Opticianry (FNAO)
- Opticians Association of America (OAA)
- National Contact Lens Examiners (NCLE)
- Contact Lens Society of America (CLSA)



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ACTIVE MEMBERSHIP — Annual dues of \$150.00. Any person possessing a valid New York State Ophthalmic Dispensing License is eligible to become an Active Member.

NEWLY LICENSED MEMBERSHIP — Annual dues of \$75.00 (first year), \$100.00 (second year), and \$150.00 (third year). Any newly licensed optician (licensed within the past six months) is eligible for the special three-year pro-rated membership incentive. Newly licensed opticians who join under the special offer will be entitled to full Active Member benefits.

ASSOCIATE MEMBERSHIP — Annual dues of \$75.00. Any person who does not qualify for Active membership but is supportive of opticianry shall be eligible to become an Associate Member. Associate Members are entitled to all the rights of an Active Member, except voting and may participate in all activities of this Society, unless specifically excluded by the Board of Directors.

CORPORATE MEMBERSHIP — Annual dues of \$150.00. Any proprietorship or corporation maintaining 51% of its licensed opticians as members of this Society and upholding the by-Laws and constitution of the Society is eligible to become a Corporate Member. Corporate Members are entitled to all rights of an Active Member, except voting and may participate in all activities of the Society, unless specifically excluded by the Board of Directors.

STUDENT MEMBERSHIP — Annual dues of ~~\$150.00~~. Any person who is enrolled as a student in a New York State-accredited program for Ophthalmic Dispensing is eligible to become a Student Member. Student Members are entitled to all rights of an Active Member, except voting and may participate in all activities of this Society, unless specifically excluded by the Board of Directors. *Waived for current membership year*