

Contact Lens Management of Post-refractive Presbyopic Patients

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ABOUT THE AUTHOR

Bethany Peebles is a contact lens fitting consultant with Art Optical Contact Lens, Inc. She joined Art Optical in 1999 and became a member of the consultation team in 2002 after graduating with an associates degree from the Ferris State University Opticianry program. She received ABO certification in 2001 and NCLE certification in 2002. She went on to earn NCLE advanced certification in 2005. As a fitting consultant at Art Optical, Bethany guides practitioners through initial design and troubleshooting of specialty lenses for a broad range of patients, including presbyopic, pediatric, postsurgical, keratoconic, and irregular corneas. Bethany is one of the initial Art Optical fitting consultants involved in the pre-launch evaluation for KeraSoft IC in the fall of 2011.

As contact lens fitters, you have no doubt broached the question of what contact lens options are available for post-refractive patients (Lasik, RK, PRK, etc) that now require presbyopic correction. This query is bound to increase—as the initial waves of post-refractive patients reach the moderate stages of presbyopia.

Radial Keratotomy or RK, the first refractive surgery developed to reduce or eliminate myopic errors, became popular in the 1980s. With the use of a diamond blade, controlled corneal incisions are made from the pupil out towards the periphery. These incisions will relax the steep central cornea and allow it to flatten, reducing or eliminating the need for myopic correction. The depth and number of cuts can vary greatly, from 4 to 32 incisions, depending on the patient's refractive error or the practitioner's preference and training. The RK incisions may not always heal properly and can cause flare and glare issues. It has since been noted that the central cornea may continue to flatten over the years resulting in progressive hyperopia.

Laser-assisted in situ keratomileusis (LASIK) is a more controlled refractive surgery which became popular in the 90s. This technique uses an excimer laser to reduce the central corneal thickness and decrease or eliminate the need for myopic correction. A thin corneal flap is created with the use of either a mechanical or laser microkeratome. This flap is folded back to reveal the stroma which is then reshaped with an excimer laser. The flap is repositioned over the treatment area and will hold its position with natural adhesion until it fully heals. This procedure allows the patient's cornea to heal quicker and with less discomfort than RK.

Post-refractive contact lens fits, for the most part, have been limited to patients

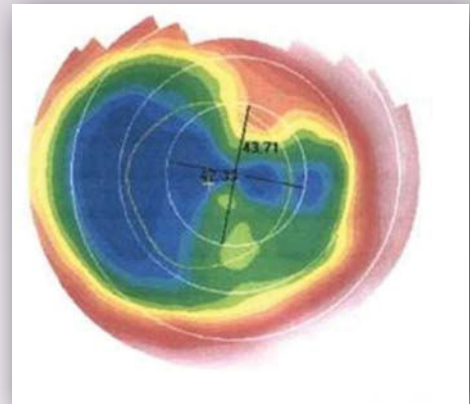


Figure 1. Lasik procedure results in decentered treatment area.

that did not achieve full myopic correction or the procedure resulted in a poor outcome (Figure 1). But there are many post-refractive patients that achieved the desired outcome (Figure 2) and until presbyopia sets in, have not required any additional vision correction. The increasing number of patients that fall into the latter category creates a new group of specialty contact lens candidates. In some cases, in anticipation of presbyopia, patients were intentionally undertreated by a diopter or so in their non-dominant eye resulting in a monovision effect. This would help push the need for near correction further into the future for them, however, even this subset of the post-surgical population is reaching the point where additional options are needed to satisfy their near demands.

When fitting post-refractive patients in contact lenses, we need to think about the shape of the cornea. This is now an oblate cornea which means that the central cornea is much flatter than the peripheral cornea, making a traditional lens design no longer appropriate. There are a number of single vision lens modalities to fit this type of cornea but few

are available in a presbyopic design. Let's review the availability of post-surgical lens design options with and without near vision correction.

GP Aspheric Posterior Surface

When the dioptric difference of the post-surgical cornea is 2D or less from center to periphery, a back aspheric design, such as the Boston Envision, can be considered. An aspheric back surface lens can be designed from topography, pre and post-surgical keratometer readings or from a diagnostic fitting set. The lens will vault the flat central cornea and align with the peripheral cornea. The fitter should expect to see slight central pooling with an aligned peripheral fit. Centration can be difficult to achieve but utilizing a larger diameter lens, such as a 10.0, will aid in positioning. The back surface eccentricity will also allow for a more central fit and the gradual change in curvature will help avoid central tear stagnation or bubbles. If a good fit is achieved with a single vision GP back aspheric design, then it is feasible that a lower eccentricity back aspheric multifocal such as Boston MultiVision or Lifestyle Multifocal may be successful. These designs use low back surface eccentricity, which will help minimize apical clearance over the treatment zone, combined with front surface eccentricity to generate higher add values. Two critical fitting points for multifocal success are good centration and adequate lens movement. The fitter will want to avoid the use of back surface multifocal designs which require exceptionally steep base curves. Multifocal designs that need to be fit 2 to 3 diopters steeper than flat K for normal corneas will have too much apical clearance over the post-surgical cornea and the patient will not obtain usable vision at distance or near. Aspheric back surface designs will work on the limited group of patients who have only had a minor surgical refractive change.

GP Reverse Geometry

When the central treatment zone of the cornea is greater than 2D difference from the unaltered peripheral area, which will be the case for the majority of post-refractive patients, a reverse geometry lens design will function better than a spherical or back aspheric GP. This design mimics the shape of the oblate cornea by using a flat central base curve over the treatment zone and a reverse curve that steepens in the periphery to match the normal peripheral topography resulting in a fairly aligned fluorescein pattern. It should be noted that GP reverse geometry lens designs for post-surgical corneas should not be confused with

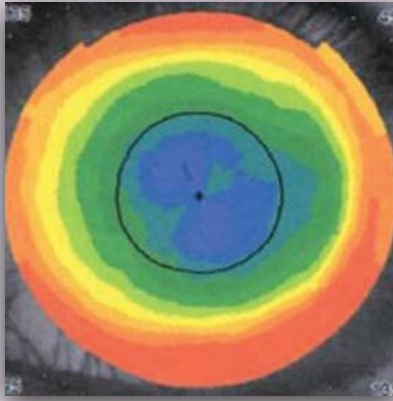


Figure 2. Lasik procedure achieves desired results.

orthokeratology lenses that use reverse geometry technology to mechanically alter a normal cornea to neutralize myopic correction. Orthokeratology lenses could possibly be utilized in post-surgical fitting situations, but they typically have a smaller optical zone diameter than recommended and lack the parameter customization capabilities many of these patients require. A reverse geometry lens is probably the most commonly used design for post-refractive patients, and until recently, RG design options were limited to distance only or used in a monovision modality.

However, with the increasing need for a presbyopic option, manufacturers have now paired a reverse geometry back surface with a front surface multifocal option.

Blanchard's RSS (Refractive Surgery Specific) offers an add-on feature of their Reclaim front surface multifocal optics. Similar to many GP multifocal designs, this provides a center distance zone that progresses out to the full near power toward the periphery. The design allows the fitter to provide up to +4.00D of add power and control over the size of the anterior distance zone. The standard diameter of 10.5 will aid in proper lens positioning. The recommended fitting process is with the use of a diagnostic fitting set but it can also be designed from topography or pre and post surgical k-readings.

Art Optical Contact Lens, Inc. offers CLASIKcn which is a reverse geometry design with a center near, front surface multifocal. The central portion of the lens has a small adjustable near zone directly over the pupil and rapidly decreases in strength to the full distance power. Similar to some soft multifocal lenses, this is considered a full simultaneous vision design and will require the lens to have good centration and stability. This is typically achieved with the use of a standard 10.8 diameter. It is recommended to be fit from topography or keratometry readings when both pre and post surgical Ks are available. A loaner fitting set is available if needed.

Soft Lens Reverse Geometry

In a general comparison to back aspheric GP lenses, standard spherical soft lens designs will likely only be successful if the patient has had a very minor surgical refractive change. For most post-refractive patients the central corneal flattening is great enough that a standard lens will not drape over the cornea properly and will tend to wrinkle or furrow in the center causing unstable vision. There are, however, specialty soft lenses that are manufactured with a flat central base curve that will align the central cornea and

a steep peripheral curve system that will bring the edges down to allow peripheral alignment and reduce lens movement/rotation.

Flexlens Post Refractive Lens by X-Cel Contacts was the first design to offer this technology. The central 8.0 front optic zone, which is generated thicker than that of a standard soft lens design, is flatter than the mid-peripheral portion of the lens. The increased center thickness and stabilizing factor of the steeper periphery allows for consistent optics. The peripheral section of the lens is generated equal to or thinner than that of a standard soft lens to provide increased oxygen transmissibility from the peripheral cornea out to the conjunctiva which is beneficial when using the hydrogel materials. To fit the Flexlens, a 15.0 diameter, 7 lens diagnostic fitting set is required.

Metro Optics provides a reverse geometry soft lens, RevitalEyes. This is designed so the lens can lay flush across the flat central cornea rather than vaulting it, thus creating a gap as it would with a thick standard lens design. It is fit with a 3 lens diagnostic fitting set utilizing a standard diameter of 14.5. Each base curve is manufactured with a set rate of peripheral steepening to provide the appropriate alignment. The fitting approach uses a 4 step process of trial lens selection, evaluation of movement, over-refraction and patient lens order.

KeraSoft IC, now manufactured in the United States by ABB CONCISE, Art Optical and Metro Optics, also offers similar, yet improved technology. The design utilizes a large posterior zone that fits a significant area of the cornea. This can allow the standard peripheral curve lenses to align appropriately; however, the peripheral curves may be adjusted independently from the base curve and can be specified up to 4 steps steeper than the central base curve. Each step equals the same peripheral change that would be associated with a .20 mm change in base curve. This peripheral curve manipulation will permit the lens to align with the peripheral cornea. KeraSoft IC requires the completion of a certification program and is fit with the use of an 8 lens trial set in a 14.5 diameter.

All three designs are manufactured in the Definitive material by Contamac, which is the first latheable high water content silicone hydrogel available. This is an optimal material option due to its increased oxygen permeability which provides an added benefit for post-surgical corneas.

Soft lens reverse geometry designs are not currently available with a presbyopic option. They would only be considered for post-surgical patients requiring distance vision correction and would necessitate the use of monovision or spectacle readers for near accommodation.

Semi-scleral

Semi-scleral and corneal-scleral lens designs generally range in diameter from 14.0 to 18.0 mm and can be used for a large number of post-refractive patients. Semi-scleral lenses (typically in the diameter range of 15.5 to 18.0 mm) completely vault the cornea and limbus and are fully supported by the scleral fit. Corneal-scleral lenses (ranging in diameter from 14.0 to 15.0 mm) share support and alignment with both the cornea and sclera while completely vaulting the limbus. Following the same concept of the reverse geometry designs, these lens types can be ordered with a flatter central curve and a steeper peripheral curve system. This minimizes the central sagittal depth with semi-scleral lenses and allows central alignment with the use of corneal-scleral designs.

There are a number of different semi-scleral/corneal-scleral lenses on the market but only a few offering a presbyopic option. DigiForm by TruForm and SoClear by Dakota Sciences (Art Optical and Metro Optics) each incorporate a front surface multifocal with center near optics that progressively decreases in plus power out to the full distance prescription. With the optics laid out in this manner, the patient will experience a simultaneous vision effect and success is dependent on the patient having a centered apex/central ablation. Most patients with a successful surgical outcome, who are just now in need of vision correction due to presbyopia, will tend to have a centered apex making them a good candidate for these designs. Centration and stability are very important in obtaining simultaneous vision and DigiForm's 15.0 and SoClear's 14.0 mm diameters are well suited to provide this.

DigiForm and SoClear vary in their fitting philosophy and manufacturing process of the front surface optics. They both need to be fit with the use of a diagnostic fitting set as with most scleral seated lens designs. Topography or pre-surgical k-readings alone will not provide sufficient information for what is happening outside the limbus.

Conclusion

Post-refractive patients that have now reached the age where presbyopic correction is required are often frustrated since they originally opted for a refractive procedure to eliminate the dependency on any type of optical device. Many will be willing to accept the use of contact lenses if it will allow them to perform all of their daily tasks. The lens designs available in a presbyopic version that will provide all range vision may currently be limited but are well worth getting acquainted with. The opportunity to expand into this field of specialty contact lens fitting continues to grow as the patient demand for this type of lens is rapidly increasing. In response to this growing demand, manufacturers continue to develop new designs or presbyopic add-on features to current designs.