

RCCL

REVIEW OF CORNEA & CONTACT LENSES

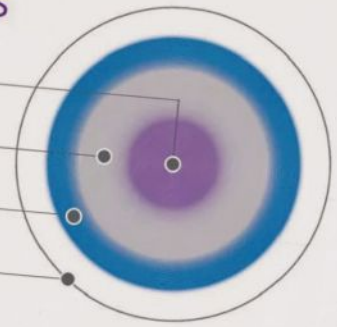
NOVEMBER/DECEMBER 2023

D lens

Distance vision
Spherical central zone

Intermediate vision
Progressive zone

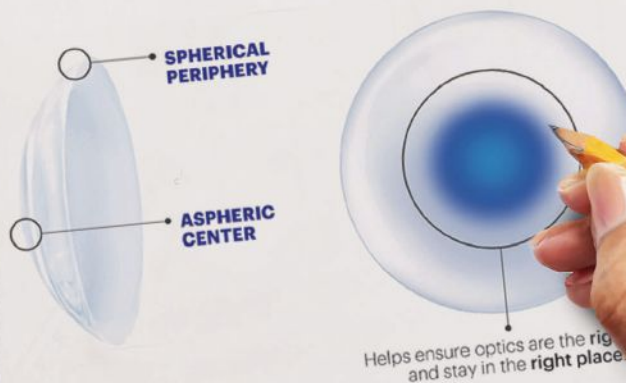
Near vision
Spherical zone



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Insurance Status, Geographic Location Limit Access to CXL

In a new study, factors of sex, race, education and income did not significantly influence who received the procedure.

Since corneal crosslinking (CXL) received FDA approval in 2016, it has proven to be a revolutionary, less invasive way to prevent keratoconus progression and delay need for penetrating keratoplasty. But has its adoption fallen prey to the same constraints that often limit healthcare access in the US—namely, insurance and income disparities? University of Pennsylvania researchers sought to explore whether socioeconomic factors contribute to the likelihood of patients receiving the treatment.

Included in their retrospective study were 552 keratoconus or corneal ectasia patients who had undergone CXL and 2,723 matched controls who did not undergo the procedure. The researchers were able to determine that an age of 30 years or older was associated with decreased likelihood of undergoing CXL. Encouragingly, sex, race, education and patient income were not linked with odds of receiving the treatment, but lower odds were seen geographically for patients who lived on the East Coast and in the lower Midwest.

The age association is a function of the natural history of keratoconus. Progression generally stops around age 40, or after 20 years since diagnosis. As such, people closer to that age, or after the age of 30, as seen with these results, would potentially make CXL less likely to happen in older, more stable patients. Additionally, older adults who would now be CXL candidates may have already received penetrating keratoplasty, thus reducing the pool of potential CXL patients. While there was no observed link of receiving CXL with sex or race, there was a trend of Hispanic and Asian patients having decreased odds of receiving CXL over white patients.

Since CXL's US introduction, 95% of the commercially insured population now has coverage for the procedure. Related to this, income itself was not linked with crosslinking uptake, but type of insurance was. Mainly, those with a health maintenance organization (HMO) plan were less likely to receive CXL than those with better coverage.

The researchers noted in their paper that CXL is complex in its likelihood of application to any given case. But, they added, “physician awareness is the first step to ensuring equitable care for patients. On a larger scale, promoting insurance companies to provide patients with easier access to specialists and out-of-network physicians have the potential to help bridge both the geographic and insurance related gaps in care.”

Lu NJ, Hafezi F, Koppen C, et al. A novel keratoconus staging system based on optical coherence tomography. *J Cat Refract Surg.* 2023;49(11):1098-105.

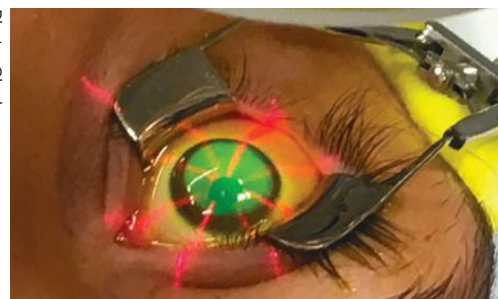


Photo: Glaukos

The researchers found geographic variability in CXL use and believe it may be linked to different environmental exposures contributing to disease severity or practice patterns of the procedure's adoption across the country.

IN BRIEF

■ To better understand and document changes in astigmatism with age, researchers recently evaluated shifts from with-the-rule (WTR) to against-the-rule (ATR) toricity over a span of 20 years. They found that such a change was more than three times more likely to pass through oblique cylinder axes as through a spherical prescription. Changes in ocular astigmatism occurred after the mid-40s (55%) with many (41%) showing no changes until after their mid-50s.

“Increases in ATR astigmatism tended to commence later in the mid-50s and changed at a greater rate per decade than the decreases in WTR found at younger ages (0.71D vs. 0.34D per decade),” the researchers explained in their paper.

Beesley J, Elliott DB. Changes in ocular astigmatism with age: a longitudinal study. Ophthalmic Physiol Opt. September 7, 2023. [Epub ahead of print].

■ Given that DED is one of the ocular manifestations that can occur in rheumatoid arthritis, a study recently evaluated the diagnostic capacity of tear meniscus osmolarity measurement for DED in these patients using a portable osmometer (TearLab). They found **the test showed low sensitivity, low specificity and limited agreement with the TFOS DEWS II composite reference standard for DED diagnosis.**

The low diagnostic capacity of osmolarity testing was similar for aqueous-deficient DED and for evaporative DED, being only fair for severe DED with a 57% sensitivity and 80% specificity and a kappa level of agreement of 0.36.

Osmolarity testing “showed a high variability within patients, regardless of their clinical condition, either non-DED, DED or severe DED,” the researchers concluded. They added, “TearLab diagnostic capacity should be analyzed by other research groups with no conflicts of interest to either corroborate or refute our findings.”

De La Parra-Colin P, Palacios-Aguirre KP, Perez-Pria-Kasusky A, et al. Diagnostic performance of the tear meniscus osmolarity measurement for dry eye disease in rheumatoid arthritis patients. Diagnostics. 2023;13(18):2994.

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Study Challenges Protective Effect of Mediterranean Diet in Dry Eye

While adherence was linked to lower serum inflammation levels, this finding wasn't indicative of decreased likelihood of developing the condition.

Advice to adopt a Mediterranean diet has been a longstanding recommendation in many spheres of health care for its protective effects against many inflammation-mediated pathologies, dry eye included. Surprisingly, a large Dutch study produced data counter to that tenet of ocular surface disease management.

The Women's Health Study dry eye survey was given to 58,993 participants (60% female) ages 20 to 94 who had dietary data available. Mediterranean diet adherence was assessed using a modified Mediterranean Diet Score (mMDS), and high-sensitivity C-reactive protein (hsCRP) served as a biomarker of whole-body inflammation.

The researchers found a dry eye incidence of 9.1% among the cohort. However, the hypothesis that a Mediterranean diet decreases risk was not supported, as higher mMDS levels were actually associated with greater odds of dry eye, even after correcting for smoking status, BMI and other comorbidities. Also found was a significant relationship between increasing mMDS and lower circulating hsCRP levels, but no meaningful relationship was noted between hsCRP and dry eye.

The authors do note that their findings are similar to a prior study on male veterans, which also linked greater adherence to a Mediterranean diet to greater odds of having dry eye. In the current study, the diet remained associated with symptomatic dry eye after excluding those with a diagnosis, reducing likelihood that reverse causality could explain these observations.



Photo: Getty Images

While local ocular inflammation is characteristic of dry eye, this study found lower whole-body inflammation levels did not map onto DED risk.

This study did link higher mMDS scores to lower hsCRP levels, indicating less overall inflammation, which is the exact reason the diet is thought to help with the disease. It is thought that adherence is anti-inflammatory in nature and has been shown to lower levels of pro-inflammatory markers in blood; but, the hsCRP levels were not indicated to map onto the likelihood of having dry eye like might be expected.

“Overall,” the authors wrote, “although local ocular surface inflammation is a major driver of the vicious circle of DED, there appears to be no clear link between circulating CRP levels and dry eye symptoms in the general population, which may explain why the findings disproved the initial hypothesis.” They wrote, in summary, “there appears to be no large population-wide protective effect against DED of adherence to a Mediterranean diet in the general population, despite its known anti-inflammatory effects.”

Magno MS, Moschowits E, Morthen MK, et al. Greater adherence to a Mediterranean diet is associated with lower C-reactive protein (CRP) levels, but not to lower odds of having dry eye disease. *Ocul Surf.* 2023;30:196-203.

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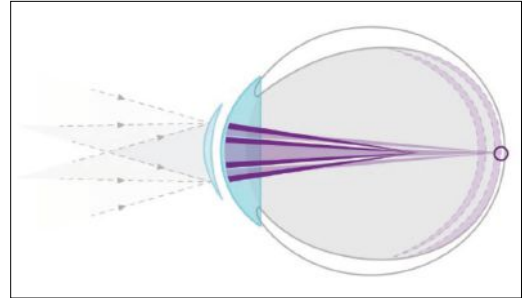


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Become familiar with the numerous options in this quickly growing market to match your patients with the lens best suited for their needs.

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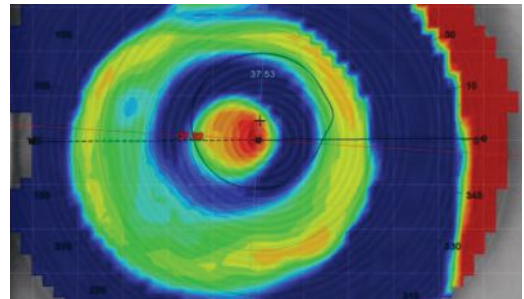
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Effectively using this modality benefits both patients and providers.

By Erin Rueff, OD, PhD

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Could it be KC (KERATOCONUS)?

KC File #1: The Patient Who Corrects to 20/20



Mitch "Private Eye" Ibach OD, FAAO, Vance Thompson Vision

A 29-year-old patient came to our office for a LASIK consult because she was unhappy with fluctuating vision in her contact lenses. The patient had ocular allergies but had no other ocular diagnoses.

Her entering glasses prescription was a modest one and we were able to refract her to 20/20. However, the refraction in the right eye was our first clue that something was not quite right.

Not only is >2.00 D of refractive cylinder a warning signal for keratoconus, but the oblique axis is also unusual. About 90% of young corneas have with-the-rule (WTR) astigmatism.¹ The change in myopic spherical equivalent (SE) from baseline (the glasses prescription) was not what we would expect to see in an adult patient, either.

Autokeratometry from her referring optometrist was on the steeper side of normal, and our pachymetry measurements showed that both eyes had borderline thin corneas. Upon further questioning, the patient recalled that her sister had keratoconus. Having a first-degree relative (a parent, sibling, or child) with keratoconus increases the risk of developing the disease by 15- to 67-fold.²

At this point, we have some risk factors, but not a clear diagnosis. A closer look at topography, tomography, and anterior segment OCT epithelial mapping provided further information to make a decisive diagnosis of progressive keratoconus in the right eye.

This case illustrates that patients who see 20/20 at the phoropter can still have keratoconus. At 29, our patient was at an age where there is greater risk of progression,³ and her ocular allergies and family history elevate that risk. She was fortunate to be diagnosed and treated early in the course of her disease, while she was still correctible to 20/20. **Simply by following the KC clues that are hiding in plain sight, you can help patients like this one preserve their vision by referring them to a corneal specialist. If further testing confirms the patient has progressive KC, iLink® cross-linking could slow or halt its progression. Visit iDetectives.com to learn more.** ●

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#FollowTheClues



INDICATIONS Photrexa® Viscous (riboflavin 5'-phosphate in 20% dextran ophthalmic solution) and Photrexa® (riboflavin 5'-phosphate ophthalmic solution) are indicated for use with the KXL System in corneal collagen cross-linking for the treatment of progressive keratoconus and corneal ectasia following refractive surgery.

IMPORTANT SAFETY INFORMATION Corneal collagen cross-linking should not be performed on pregnant women. Ulcerative keratitis can occur. Patients should be monitored for resolution of epithelial defects. The most common ocular adverse reaction was corneal opacity (haze). Other ocular side effects include punctate keratitis, corneal striae, dry eye, corneal epithelium defect, eye pain, light sensitivity, reduced visual acuity, and blurred vision. These are not all of the side effects of the corneal collagen cross-linking treatment. For more information, go to www.livingwithkeratoconus.com to obtain the FDA-approved product labeling. You are encouraged to report all side effects to the FDA. Visit www.fda.gov/medwatch, or call 1-800-FDA-1088.

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Refraction and exam findings

	RIGHT EYE	BCVA	LEFT EYE	BCVA
Lensometry	-0.50 -1.50 x31	20/30	-1.50 -0.50 x172	20/20-
Refraction at Phoropter	-0.75 -2.25 x34	20/20	-1.75 -0.75 x160	20/20+
Pachymetry	478 µm		483 µm	
Autokeratometry	45.5 / 47.50 x 112		44.9 / 46.75 x80	

KC File #1: THE CLUES

- Large change in refraction from lensometer to phoropter
- High astigmatism (-2.25 D) with an oblique axis
- Borderline thin corneas (478/483 µm)
- Relatively steep auto Ks (47.5)



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COVID-19 Redux

Let's go over unanswered questions about the disease's chances of ocular transmission.

As most areas in the US have recently experienced an uptick in new COVID-19 infections, questions regarding both possible downstream transmission via the ocular surface and contact lens wear safety have resurfaced and abound once again. It's hard to imagine, but we still have patients present after over 3.5 years dealing with the disease who have concerns about wearing their contact lenses. Not to mention the few who have refused annual examinations worried about contracting the infection while in our office.

Each day, I have several patients who raise the concern for potential eye transmission and, specifically, if they can still wear contact lenses safely. Unfortunately, we still have gaps in knowledge as it relates to transmission and lens wear safety. So, let's look at what we now know about COVID infections and the eye and how might we address patient concerns.

To start, it goes without saying that COVID-19 is here to stay. Just like influenza, new variants will appear every year. Like the flu vaccine, COVID vaccines may either be robustly effective with some durability or have a limited protective effect. This is all based on our ability to predict which variant(s) might hit a certain area.

EYE TRANSMISSION

The likelihood for the ocular surface being the gateway for SARS-CoV-2 infection or transmission is low but certainly feasible.^{1,2} Concerns remain for possible downstream transmission through the tears even without ocular signs and symptoms, even with the low prevalence of virus found in tears. The ocular surface serving as a reservoir may cause conjunctivitis and discomfort.^{1,3}

SARS-CoV-2 receptors in the eye have been documented and may explain the relative viral tropism to the ocular surface similar to other viruses.³

The eye's microbiome along with natural defense mechanisms (lactoferrin and IgA with other protective proteins and the blink mechanism) may keep the probability of SARS-CoV2 binding to ACE2 receptors low, thereby protecting the eye from the coronavirus.³ Researchers determined that late-stage COVID-19 patients might not harbor an ocular reservoir of SARS2, making it likely that transmitting SARS-CoV-2 via ocular tissues and fluids is low.⁴ However, it's likely the viral load in real time PCR testing of human tears may remain below detection threshold levels.² Also, when there is any viral load detected on the ocular surface, it might come directly from the sinuses.³

CONTACT LENS SAFETY

Several reports have examined the safety of lens wear and there is no evidence to suggest any added risk of contracting an infection through contact lens wear.^{5,6} A recent review shows nothing to the contrary.

Overall, even though the ocular surface has the likely potential to serve as a reservoir and source of SARS-CoV-2 (via hand-eye contact or aerosol), the infection rate remains low.^{1,2,4} The CDC continues to suggest there is no added risk for COVID-19 infection with lens wear when proper hygiene practices are employed (www.cdc.gov/contact-lenses/observance-resources.html). The CDC provides a number of tools and materials to help promote contact lens health.

Various tips in order to avoid infections such as COVID include onstant reminders to avoid overnight wear,

wash hands thoroughly and frequently, clean and replace contact lens storage cases and keep their lenses away from water. Remind patients to have back-up glasses and encourage them to call their eyecare provider with any questions.

To summarize several reports that have examined the safety of lens wear, there is no evidence to suggest any added risk of contracting a COVID-19 infection through contact lens wear.⁶ Overall, even though the ocular surface has the likely potential to serve as a reservoir and source of SARS-CoV-2 (via hand-eye contact or aerosol), the infection rate remains low.^{1,2,4}

Eyecare providers must continue to reassure lens wearers that they are at a very low risk for infection. More than ever, it gives us both the responsibility and opportunity to emphasize the importance of highlighting the much-needed steps for good lens wear hygiene. Education in the office also helps deflate rumors that contact lens wear is unsafe with any new resurgence. **WCC**

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Mismatch Made in Heaven: When GP Met Scleral

While different lens modalities can be complex for patients to manage, the right instance may lend itself as the best choice.

A 42-year-old male presents for contact lens fitting secondary to post-refractive surgery corneal ectasia OU. He has a history of LASIK OU, after which he developed ectasia OU. More recently, he underwent corneal crosslinking (CXL) on his right eye only, as stromal scarring and significant thinning was noted in the left eye. He presents wearing his habitual rigid gas permeable (RGP) contact lenses and reports his left lens never feels stable on his eye; thus, his goals are to have the best vision possible and to improve lens comfort.

Manifest refraction is -3.50 -5.00x035 OD and -4.50 -4.50x045 OS with visual acuities (VA) of 20/25 OD and 20/400 OS. The slit lamp revealed epithelial irregularity over the corneal scarring OS, 1+ superficial punctate keratopathy inferior OU and 1+ three and nine o'clock corneal and conjunctival staining worse OS. The right lens shows a lid attachment fit with movement of 1.0mm and good centration. However, the left lens shows an interpalpebral fit with harsh touch over the apex with paracentral clearance and excessive edge lift inferior. Best-corrected VA (BCVA) in GPs are 20/20 OD and 20/30 OS. Scheimpflug tomography (Pentacam, Oculus) showed asymmetric irregular astigmatism, with the left eye having steeper Ks along with thinner pachymetry values than the right eye.

CONSIDERATIONS

Here, we highlight our thought process and consider how we would proceed:

Dr. Pfeifer: When deciding what lens modality to fit for any patient, but

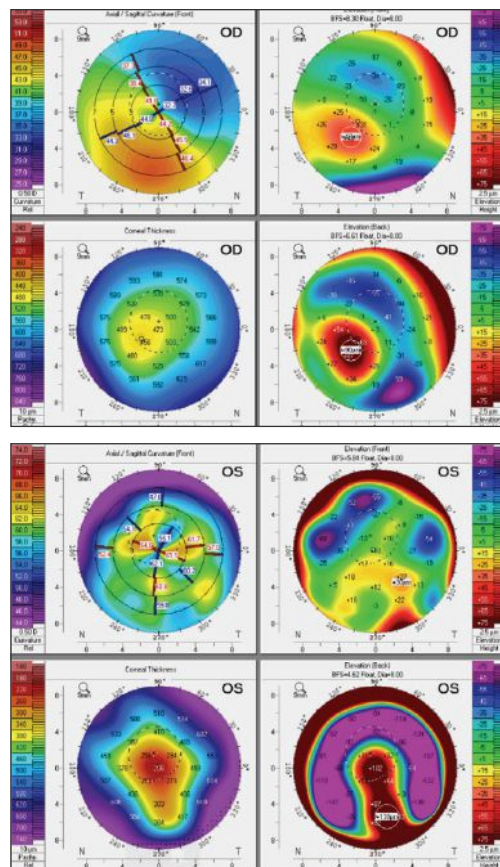
especially for those with asymmetric corneas, I like to rely on the front elevation. This patient has relatively similar front elevation differences in each eye, but the pattern of peaks and valleys is much more irregular OS than OD; this irregularity can make the movement and centration of a corneal GP less predictable, which can lead to comfort issues. Because of this, I'm inclined to switch the left eye into something that can avoid this irregularity, like a scleral lens. But what about the right eye?

There are three options for how to manage this patient going forward: leave the patient in a corneal GP OD while changing to a scleral lens OS, switch both right and left lenses to sclerals or try something completely different. For simplicity, I would discuss the first two options with the patient initially to gauge their opinion.

Two different lens modalities means two different cleaning, application and removal methods, so switching one eye only may cause undue stress. However, this patient may look at his history of success with the corneal GP OD and not want to go through the hassle of pursuing a new correction method. He may also notice the difference once he begins wearing the scleral lens in the left eye and starts to notice issues with the GP. This is why it is integral to get to know the patient and discuss their goals and/or concerns with

lens wear. Trialing the lenses in-office and ensuring the patient's awareness of wear and care of the different lenses will lead to greater chances of success in the chosen modality(ies).

Dr. Su: For this patient, the primary objective is to achieve optimal vision and comfort with his lenses. The left eye has had some discomfort with an RGP, and likely the scarring is due to a poor fit, suggesting the potential need for a refit. The front elevation maps indicate greater irregularities in the



Corneal tomography of the patient's right eye (top) and left eye (bottom).

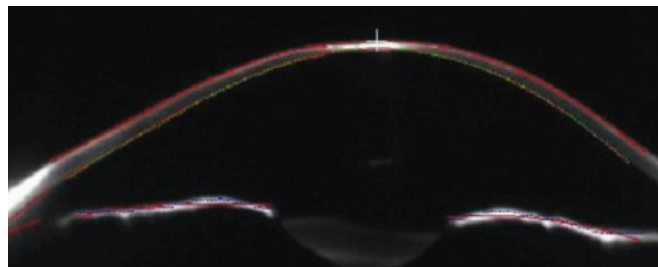


left eye which may account for this discomfort. A scleral lens, which vaults the cornea entirely, can provide clear optics and comfort.

However, potential challenges can occur if lenses of different modalities are worn in each eye, leading to lens awareness. If the patient is apprehensive, consider fitting the right eye with a scleral lens too. For the devoted long-term RGP wearer reluctant to transition, you can try redesigning the GP. Furthermore, technology has greatly evolved over the years! For eyes with more complex geometries, freeform GP lenses can be designed to better match the eye's contours, compared with more traditional RGPs. This would ensure better lens stability while providing effective movement and efficient tear exchange.

Dr. Noyes: For me, this case has a lot of options: GPs, sclerals, hybrids, oh my! I think the biggest takeaway from this is “when is it time to switch from a GP to a scleral?” This patient was initially prescribed bilateral GP lenses but switched to a scleral in the left. In this case, the patient successfully adapted to his GP lens OD, but noted a feeling of instability OS. Especially in complex fits or patients with irregular astigmatism (such as with corneal ectasia), stability is a must; these patients require contact lenses to reach their BCVA. If the lens doesn't stay on the eye properly, it can have devastating visual consequences on the patient's day-to-day function. Scleral lenses do offer an advantage over RGPs in terms of corneal stability in these cases, and I think Dr. Pfeifer navigated that in an excellent fashion.

Dr. Gelles: This is the quintessential ectasia case: asymmetric in severity,



Schiempflug cross-sectional image of the left cornea. Note the central corneal scar.

very correctable with a manifest on the less severe eye. Foremost is the issue of corneal stability; this patient was well managed, having undergone CXL in the right eye, but as the ectasia is too far gone for CXL on the left eye, there is nothing else to be done. A recent publication reviewed long-term stability of corneas treated with CXL as part of an FDA clinical trial. The researchers found over the long-term, eyes with keratoconus seem to be more stable than those with post-refractive corneal ectasia.¹ This highlights the importance of educating and continued monitoring of these patients, keeping in mind that treatment with CXL may be repeated in patients showing continued progression.

As for lenses, this patient could succeed with a variety of lens strategies—whether scleral, redesigned GP or hybrid—but the simplest option is a soft piggyback. This can be demonstrated in the office immediately with a diagnostic disposable soft lens. As the more severe eye is not so extreme in shape, this could be an ideal option and not even require a modification to the GP. If unsuccessful, the next choice would be a scleral lens or GP redesign. As noted previously, preference is generally to use the same type of lens in each eye for maintaining similar ocular comfort and lens care.

DISCUSSION

It is important to keep the patient's goals and comfort in mind when considering contact lenses for individuals with dramatic asymmetry in topography or corneal presentation. When discussing lens options with

patients, educate them on the wear and care of different lens modalities. The burden of two separate cleaning regimens or insertion and removal methods may increase the chance of complications. Try to keep it simple, such as the use of hydrogen peroxide-based disinfection, which can be used for both soft and rigid materials. If a different lens modality is selected for each eye, inform the patient not to compare the two eyes. After all, “comparison is the thief of joy.” For some patients, matching modality in both eyes may beget greater success due to similar comfort levels between eyes and the ease of one routine.

RESULTS

While this patient had mild success wearing an RGP lens in the left eye, he was ultimately prescribed a scleral lens. The choice was made due to the presence of apical corneal and patient complaints. After discussing the option of wearing a scleral lens in both eyes, the patient preferred to continue with GP correction in the right eye. He has been successful with the asymmetric lens modality and now has a BCVA of 20/20 OD and 20/25 OS. [\[CC\]](#)

1. Greenstein SA, Yu AS, Gelles JD, Huang S, Hersh PS. Long-term outcomes after corneal cross-linking for progressive keratoconus and corneal ectasia: a 10-year follow-up of the pivotal study. *Eye Contact Lens*. 2023;49(10):411-6.

MULTIFOCAL CONTACT LENS DESIGNS:

KNOW THE PLAYERS

Become familiar with the numerous options in this quickly growing market to match your patients with the lens best suited for their needs.

By Thomas Stokkermans, OD, PhD

While monovision contact lenses (CLs) for presbyopia occupied the throne for a long time, this has shifted over the last couple of decades as more disposable multifocals have entered the market, making it gradually more apparent that patients prefer this modality. While recent research on this trend is limited, a 2006 study that compared Bausch + Lomb's SofLens multifocal to a SofLens 59 monovision fit reported that 76% of patients preferred the multifocal.¹

At first, the lack of multifocal toric soft CLs (SCLs) on the market left astigmatists with limited options. These patients could be offered rigid gas-permeable lenses (GPs). However, the absence

of an immediate on-eye experience, the upfront costs, risk of CL discomfort, complexity of fitting multifocal GPs and the danger of corneal molding with the earlier aspheric designs were, and to some degree still are, significant barriers.²

In 2007, astigmatic patients were finally presented with a solution when CooperVision launched the first monthly multifocal toric lens (Proclear). Trial lens kits were not practical, as this lens comes in a large range of parameters. Therefore, trial lenses had to be ordered to allow for a follow-up visit where several lens combinations could be tried.³ After B+L's Ultra multifocal for astigmatism became available in 2019 and practitioners were provided with trial lens sets, presbyopic astigmatists could finally undergo an immediate on-eye experience.⁴

Since B+L launched the first soft multifocal lens in 1984, there are now over 60 different brands made by 15 companies.^{5,6} These brands employ technologies that include aspheric optics, concentric circle designs, translating lenses or a combination of these features.⁷

These evolving technologies have allowed for a gradual increase in the number of presbyopes fit into CLs. Between 2003 and 2019, the percentage of all CL fittings that was for presbyopes rose from 20% to 35%, and between 2005 and 2020, the percentage of presbyopes that were fit into multifocal lenses compared to single-vision lenses doubled from 25% to 50%.^{6,7} The increasing demand for this service makes it more important than ever for clinicians to be knowledgeable about the many multifocal lens options that exist to make the most appropriate selection for each patient and improve satisfaction of wear.

While numerous types of multifocal lenses exist, such as corneal GP, scleral and hybrid lenses, this article will focus

Photo: Alcon

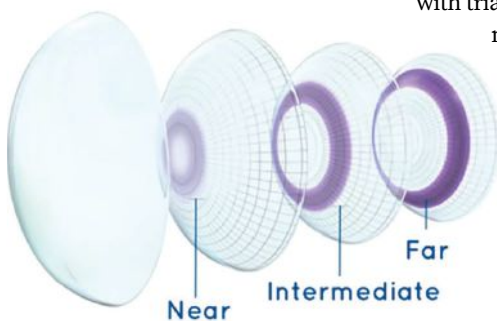


Fig. 1. Alcon's "precision profile design" (in Dailies Total1, Dailies AquaComfort Plus and Air Optix plus HydraGlyde multifocal lenses) provides additional minus power at the optic zone edge to optimize near vision without compromising distance acuity.

ABOUT THE AUTHOR



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specifically on SCL options for patients with presbyopia and/or astigmatism. These lenses are also more common than rigid designs; last year in the US, soft multifocal lenses made up more multifocal lens fittings (12%) than rigid lens designs, which made up only 1%.⁸

Below, we catalog in alphabetical order the wide selection of these lenses available today. While the four largest CL companies (Alcon, B+L, CooperVision and Johnson & Johnson Vision Care) dominate the multifocal SCL market, there are many others that have innovative designs worth considering for your patients.

ALCON LABORATORIES

Following the Air Optix Aqua multifocal launch in 2009 and Air Optix plus HydraGlyde multifocal in 2018, Alcon has become a leader in this market segment. All its lenses come in three center-near aspheric bifocal adds.

- **Air Optix plus HydraGlyde Multifocal.** This silicone hydrogel (Iotrafilcon B) monthly lens employs what the company calls a multifocal “precision profile” that combines a bi-aspheric surface, adaptive minus power profile and center-near design. The benefit to the patient is that the aspheric front-surface enhances overall image quality, the aspheric back-surface allows better lens centration, and the adaptive minus-power profile provides additional minus power at the edge of the optic zone, which allows “pushing plus” so that near vision can be improved without compromising distance acuity (Figure 1).

An advantage of this lens is that it’s available in three add powers, allowing precise balance of the near and distance visual acuity. It may also be a good option for the budget-conscious CL wearer.

- **Dailies AquaComfort Plus Multifocal.** This daily disposable lens comes in a HEMA material (nelfilcon A) and employs the same precision profile design as in the Air Optix plus

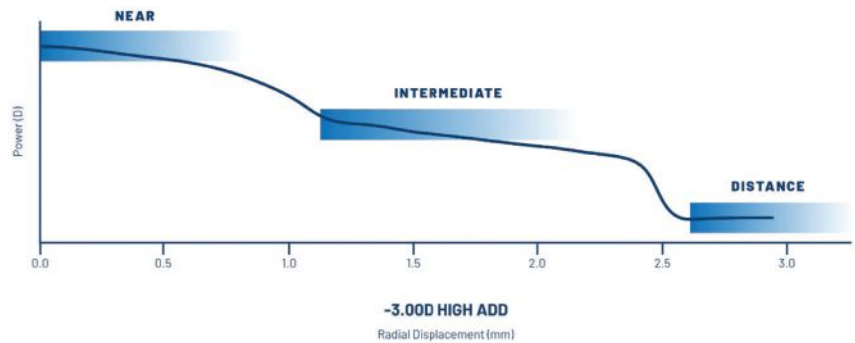


Fig. 2. This graph shows B+L’s “3-zone progressive design” add transition for a -3.00D high add. This feature is included in the company’s PureVision 2 for presbyopia and Ultra multifocals.¹⁹

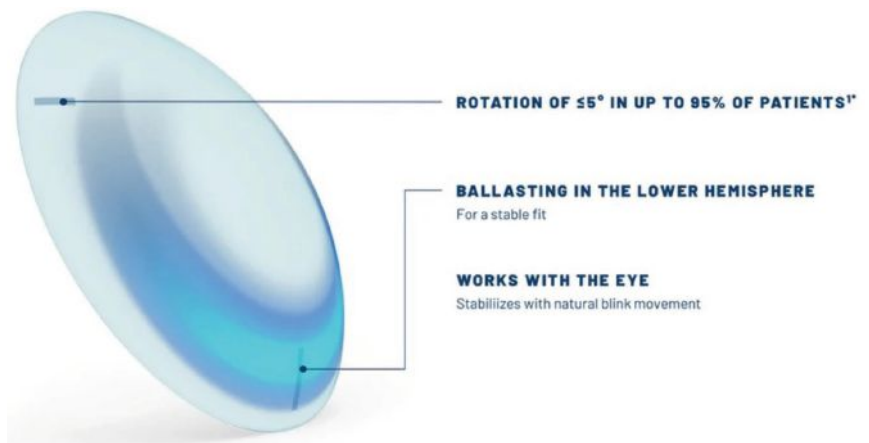


Fig. 3. B+L’s “OpticAlign” design, featured in Ultra multifocal for astigmatism, guarantees a rotation of 5° or less for 95% of patients.

HydraGlyde multifocal. This guarantees equivalent visual performance of all of Alcon’s multifocals and allows certain patients to transition easily between the different options, such as those who prefer occasional wear or the convenience of a daily disposable lens, or those who have become CL-intolerant due to allergies or deposits.⁹

Dailies AquaComfort Plus multifocal is suitable for presbyopes desiring a hypoallergenic, affordable daily lens.

- **Dailies Total1 Multifocal.** Dailies Total1 (delefilcon A) CLs incorporate “water gradient technology,” combining a high Dk with a lens surface that is nearly 100% water.¹⁰ Due to its hydrating properties, this lens is an excellent choice for patients with dry eye or extensive digital device use.

- **Total30 Multifocal.** Total30 multifocal (lehilcon A) is a one-month

replacement high Dk soft lens that also employs “water gradient technology” as well as “celligent technology,” which the company says provides long-lasting hydration and resistance to lens deposits. Launched just last month, with the same multifocal design as other Alcon lenses, this lens is a top choice for patients that prefer a high-performing monthly replacement multifocal.¹¹

BAUSCH + LOMB

While the smallest of the “big four,” this company has long been a leader in innovation and a consistent player in the multifocal segment. Since B+L made the first SCL multifocal, it has had many successful multifocal brands, including the SofLens multifocal, PureVision multifocal, PureVision 2 for presbyopia, Ultra for presbyopia, Biotrue OneDay for presbyopia, Infuse multifocal,

Photos: Bausch + Lomb

MULTIFOCAL CONTACT LENS OPTIONS

Revive multifocal and Astera multifocal. The Ultra, Revive and Astera multifocal options are offered in toric versions as well.

Let's break down the current multifocal SCL options in B+L's portfolio:

- **Astera Multifocal and Multifocal Toric.** This highly customizable frequent replacement lens was developed by Alden Optical, which was acquired by B+L in 2016. This center-near lens is made of a lower-Dk HEMA derivative (hioxifilcon D) that comes in a large range of powers (-30.00 to +30.00D), base curves (6.5 to 9.7), diameters (10mm to 16mm) and three adds (low, medium, high) with the highest add of at least +2.50D.¹² The C2 multifocal design consists of a large-intermediate and a near zone that can be adjusted from 1.8mm to 3mm to accommodate the patient's pupil size or work conditions. The toric multifocal lens provides around-the-clock cylinder powers in 1° increments from -0.50D to -10.00D in 0.25D steps using a precise dual slab-off process ("dual elliptical stabilization system," as the company calls it) that intends to provide superior rotational stability.^{5,13,14} This lens should be on your list of options for patients with high refractive errors who prefer multifocal soft CLs.

- **PureVision Multifocal and PureVision 2 for Presbyopia.** While both brands use the same material (balafilcon A) with a low or high center-near aspheric multifocal design, the PureVision multifocal, launched

in 2005, lacks some of the unique design features of the newer PureVision 2 for Presbyopia, which came out in 2013. The latter lens is thinner, significantly increasing its Dk, the edge bevel is flattened and, most importantly, the center-near aspheric optics have been improved to contain three progressive zones for distance, intermediate and near instead of only a near and distance zone present in the original PureVision multifocal (a feature that B+L calls the "3-zone progressive design;" *Figure 2*).¹⁵ This makes the PureVision 2 more comfortable as well as provide better near acuity.¹²

- **Revive Multifocal and Multifocal Toric.** Launched in the fall of 2022, Revive is the newest addition to B+L's portfolio, made of the same material and offering the same customizable parameters as the Astera lenses. Unlike the Astera, the Revive lens also comes in a custom sphere and toric lens without the multifocal.^{5,13,16}

- **SofLens Multifocal.** This low water content, non-ionic HEMA (polymacon) two-week replacement lens was launched in 2002 and comes in two base curves, two bifocal adds and a center-near aspheric design. There are still some loyal SofLens multifocal wearers, as this is one of the few two-week replacement HEMA lenses available with a proven favorable depositing profile.¹⁷

- **Ultra for Presbyopia and Ultra Multifocal for Astigmatism.** The Ultra

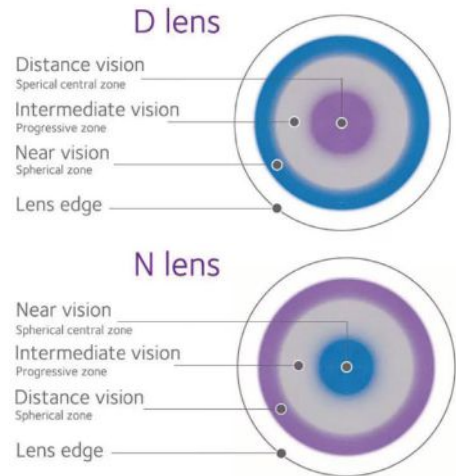


Photo: CooperVision

Fig. 4. CooperVision's "balanced progressive technology" featured in Biofinity and Proclear multifocal SCLs provides a near and distance spherical zone separated by a large progressive intermediate zone.²⁶

is made from a new silicone hydrogel material (samfilcon A) that employs what B+L calls "MoistureSeal technology"—a curing process that seals the lubricant polyvinyl pyrrolidone (PVP) into the contact lens, allowing a four-fold increase in PVP content. The result is an increase in Dk and water content compared to the PureVision 2 (46% and 163Dk/t compared to 36% and 130Dk/t).

The Ultra for presbyopia has been on the market since 2016 using the same 3-zone progressive design as the PureVision 2 but with added aspheric optics for reduced halos and glare.¹⁸ B+L's research accounted for pupil diameter, corneal curvature, refractive error, axial length, higher-order

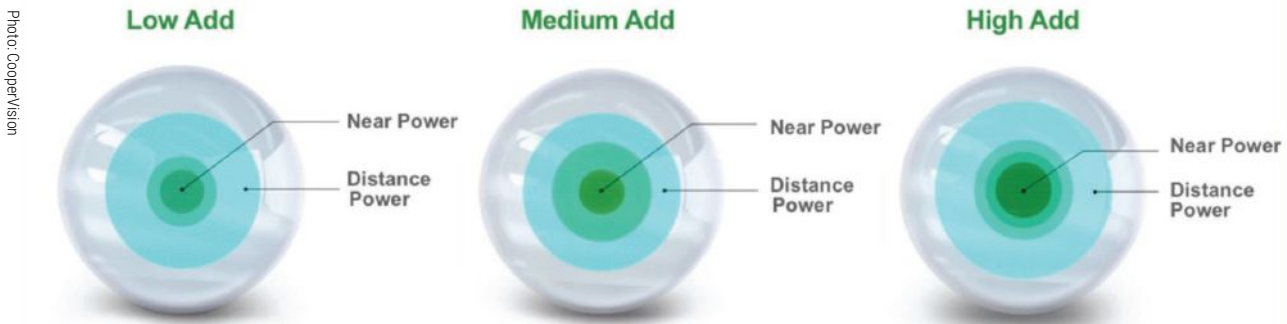


Photo: CooperVision

Fig. 5. This image illustrates the "binocular progressive system" in CooperVision's MyDay multifocal. With higher adds, the size and power of the near and intermediate zones are increased.²⁷

aberrations and accommodation at multiple distances to produce a lens that maximizes real-world far, near and intermediate visual acuity.¹⁵

The Ultra multifocal for astigmatism employs the same design as the Ultra for presbyopia and is the only lens in this category that comes with a fitting set of cylinder powers up to -2.25D for immediate in-office fitting. A -2.75D cyl power can also be ordered from B+L. The toric design, coined “OpticAlign” by developers, is made up of a combination of inferior prism ballast and two superior temporal and nasal thin zones for a reported rotation of 5° or less for 95% of patients (Figure 3).¹⁹

The Ultra might be a convenient choice for astigmatic presbyopes who prefer multifocal soft CL correction.

• **Biotrue OneDay for Presbyopia.**

Biotrue (nesofilcon A), along with the Infuse and Ultra brands, contain aspheric optics optimized for each individual lens power. This lens again features the company’s 3-zone progressive design, a water content of 78%—matching that of the cornea—and PVP. It also contains poloxamer 407—a polymer that rises to the lens surface while the lens is curing. Together, these features help to provide hydration and high-quality vision that has been shown in company trials to last throughout the day for most wearers. Biotrue OneDay also absorbs UV light.^{9,20} This lens may benefit presbyopes who desire sharp vision in a daily disposable modality.

• **Infuse Multifocal.** Infuse is a next-generation daily disposable silicone hydrogel material (kalifilcon A) that combines a high moisture content (55%), high oxygen transmission (134Dk/t), a low modulus (0.5MPa) and “probalance technology,” as B+L puts it, which means the lens consists of the osmoprotectants erythritol and glycerin, the electrolyte potassium and moisturizers poloxamine 1107 and poloxamer 181. The “probalance” design feature was developed based on data from the TFOS DEWS II report that showed an

important role for these molecules in dry eye.²¹ Infuse Multifocal also uses the 3-zone progressive design and absorbs UV light like Biotrue OneDay.²² This extensive array of features makes this a premium multifocal suited to patients with allergies, dry eye, long wearing hours and extensive near tasks.

COOPERVISION

When it comes to variety and the widest range of parameters, CooperVision takes the prize in the multifocal SCL market. The company makes several brands that come in a center-near (“N”) and center-distance (“D”) multifocal design, which provides “modified monovision” fitting opportunities by optimizing the dominant eye with the D lens for distance and the non-dominant eye with the N lens for near vision.

The following multifocal SCLs are currently offered by CooperVision:

• **Biofinity Multifocal and Biofinity Toric Multifocal.** Biofinity (comfilcon A) is a monthly, breathable (160Dk/t) silicone hydrogel lens made with the company’s “aquaform” design to lock in moisture and increase comfort.²³ Biofinity multifocal and multifocal toric lenses come in a wide range of sphere powers and in four add powers (+1.00D to +2.50D) in a center-near and distance-near lens. The company’s “balanced progressive” feature allows

for a near and distance spherical zone separated by a large progressive intermediate zone, giving clinicians the option to choose between an N or D lens (Figure 4).

The Biofinity Toric Multifocal comes in a -0.75D to -5.75D cylinder range in 5° steps around the clock. CooperVision’s torics are known for their rotational stability, using something called “optimized toric lens geometry” consisting of a wide ballast band, uniform lens thickness across the horizontal path, a larger toric optical zone and a soft, uniform surface for more stable vision.³

CooperVision provides fitting sets for the Biofinity multifocal that allow an immediate on-eye experience and the opportunity to gauge the ability to adjust to modified monovision with a D lens in one and an N lens in the other eye. This makes the Biofinity a suitable lens choice for patients with presbyopia progression that can accept modified monovision and cannot achieve distance vision in adequate focus with their habitual lenses.

• **Clariti 1 Day Multifocal.** With one study reporting 75% of daily disposable CL wearers nap in their lenses, Clariti 1 Day multifocal is a more breathable silicone hydrogel (somofilcon A, 86Dk/t) alternative to other less oxygen-permeable daily disposable lenses.²⁴ The lens comes in two center-near progressive

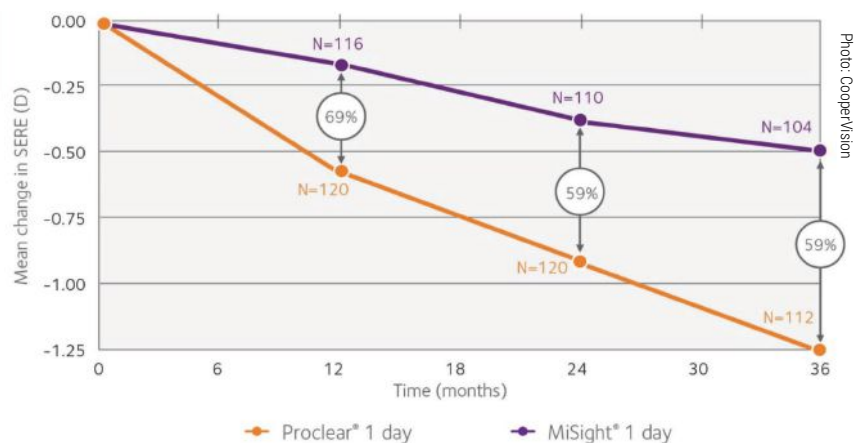


Fig. 6. A study of CooperVision’s MiSight 1 day lenses demonstrated a 59% reduction in myopia progression as well as a 52% reduction in axial length growth over a three-year period.²⁹

MULTIFOCAL CONTACT LENS OPTIONS

adds and filters UV light.²⁵ Patients requiring a higher Dk lens may be offered this option.

- **MyDay Multifocal.** While the Dk of the Clariti will generally fix conjunctival redness, limbal encroachment and reduced end of day comfort, CooperVision's MyDay is a daily disposable high water content silicone hydrogel (stenfilcon A, 54% water) with an even higher oxygen transmissibility (100Dk/t) that comes in three progressive center-near add powers; the size and power of the near, intermediate and distance zones are adjusted for optimal acuity, a feature the company calls a "binocular progressive system" (Figure 5). The patient who requires a high Dk multifocal daily disposable with an excellent center-near add may be offered the MyDay Multifocal as a premium option.

- **MiSight 1 Day.** This is the only lens FDA-approved for myopia management (for ages eight through 12). It uses a design CooperVision calls "ActivControl technology" (Figure 6). The lens is made from the same material as the Proclear (omafilcon A) and contains a center-distance zone surrounded by three rings that alternate between a +2.00D add and distance correction (Figure 7). The two rings that contain an add—the "treatment zones"—generate myopic defocus. Since the lens is used for patients who are developing myopia and not those with hyperopia, it does not come in plus powers. The treatment zones are designed to create myopic defocus and not to help focus up-close, as is the case in lenses designed for presbyopia. Research has shown accommodation is equally active in children wearing or not wearing the lens.²⁸

- **Proclear Multifocal, Proclear Multifocal XR and Proclear Multifocal Toric.** The monthly replacement Proclear line of contacts is made from the first material FDA-approved for dry eye (omafilcon B) and became a

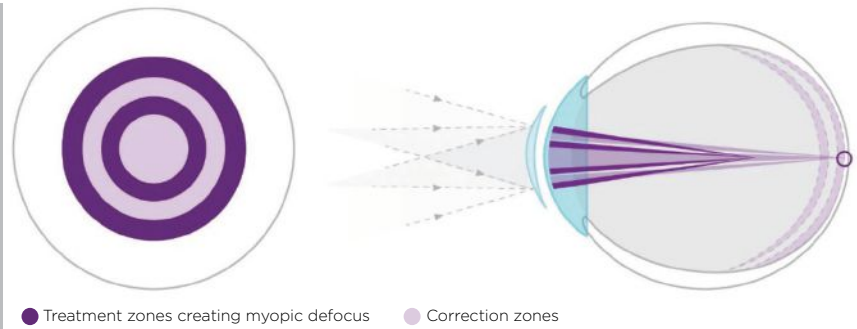


Fig. 7. The MiSight 1 Day lens uses what the company calls "ActivControl technology," consisting of two discrete rings with a +2.00D add (dark purple) to create myopic defocus on the retina.²⁹

central part of CooperVision's offering when the company purchased Biocompatibles Eyecare in 2002. While this material has a high shear factor (tendency to rip or crack) and requires more careful handling, its high water content (62%) and zwitterionic nature that mimics cell membranes make this a comfortable lens with reduced depositing.⁹

The lenses come in seven aspheric center-near and center-distance adds (+1.00D to +4.00D in 0.50D steps) using the same "balanced progressive" feature as Biofinity multifocal and multifocal toric. Since it's possible to fit both eyes with a D or an N lens, as well as a D in one and an N in the other, there are many lens combinations that can be tried based on the patient's needs, blur tolerance and ability to accept modified monovision.²⁶

Both the Proclear Multifocal XR and multifocal toric are available in a -20.00D to +20.00D sphere power range and a steep and flat base curve. The multifocal toric is available in a -0.75D to -5.75D cylinder power range in 0.50D steps and in axis 5° to 180° in 5° steps.⁵ The large number of parameters and the ability to provide a distance-center lens makes fitting of these lenses flexible for patients who are new to multifocal CLs or have failed monovision or other multifocal designs.

J&J VISION CARE

The original Acuvue bifocal consisted of five concentric rings alternating between distance and near, progressing from a center-distance zone (Figure 8).³⁰

Acuvue Oasys for Presbyopia was another center-distance design with a more gradual transition between the

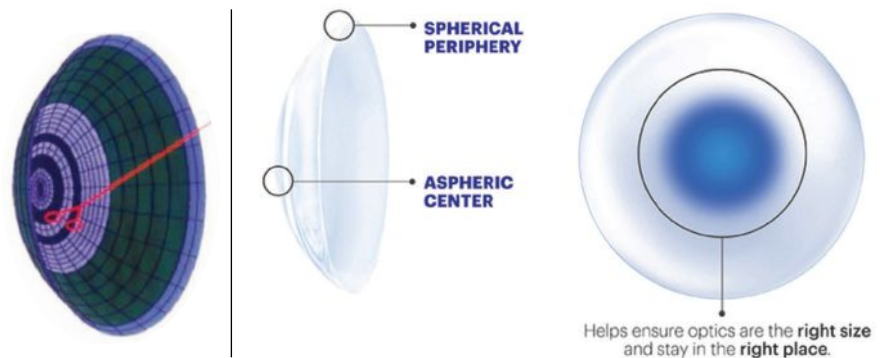


Fig. 8. The original Acuvue bifocal CL (left) had five concentric rings to reduce glare in low lighting. The present design (right) is aspheric within the center but spherical in the periphery and the optic zone varies by the patient's refractive power and age.

distance and near zones; it was made of senofilcon, one of the most popular materials ever used in a contact lens. This multifocal lens was discontinued in 2022, and J&J Vision Care currently has three lenses on the market with an aspheric center-near design that is adjusted for pupil variation with the higher adds adjusted for age-related miosis as well as refractive error (Figure 8).³¹ We'll discuss the details of each of these lens options below.

• **1-Day Acuvue Moist Multifocal.** This HEMA (etafilcon A) daily disposable lens comes in three adds. The aspheric center-near zone is made smaller for higher adds and hyperopic corrections to correspond for decreases in the size of the pupil in hyperopes and as we age (Figure 9). The 1-Day Acuvue Moist Multifocal allows for optimal vision quality regardless of age and refractive error and is an excellent starting point for new multifocal wearers, especially latent hyperopes

who are resistant to full-time spectacle wear and have progressed to need constant refractive correction for both distance and near.

• **Acuvue Oasys Max 1-Day Multifocal.** For enhanced near comfort, this daily disposable combines pupil optimization, SiHy material and a blue light filter (called OptiBlue). According to J&J Vision Care, the lens absorbs 60% of blue light, decreasing light scatter by up to 20%, halos by up to 30% and starbursts by up to 23% for sharper vision and better comfort.³² The increasing use of digital devices makes this a lens that could benefit all presbyopic contact lens wearers.

• **Acuvue Oasys Multifocal.** This bi-weekly SiHy lens (senofilcon A) comes in three adds with a pupil-optimized design, allowing for the comfort of the Acuvue Oasys material in a lens that adapts the near zone to the pupil size and refractive error. Good candidates for this lens are the large segment of

CL wearers who are already pleased with Acuvue Oasys lenses and now require presbyopic correction.

VISIONEERING TECHNOLOGIES INC (VTI)

While a much smaller company than the “big four,” VTI offers one multifocal—NaturalVue Enhanced multifocal—that features a virtual pinhole design to increase the range of clear vision. For patients who need a high add, this lens may be a contender. This HEMA daily disposable (etafilcon A) boasts center-distance optics surrounded by a rapid progressive increase in plus power to an equivalent add of +3.00D. It generates peripheral defocus like the MiSight 1 Day and is currently being studied for myopia management applications.³³ The absence of a central spherical distance zone generates a virtual pinhole aperture to create nearly twice the range of clear vision as multifocal lenses that do have spherical zones.³⁴ The

Quarterly and Annual Replacement Multifocal Lenses

Several companies offer quarterly and annual replacement SCLs that come in a wide range of extended parameters and unique designs. ODs should have accounts with at least a few to be able to fit patients with more extreme refractive errors and other ocular parameters—e.g., excessively steep or flat corneas, a large or small cornea, irregular or large pupil—without need for referral to a specialty CL practice.

• **ABB Optical** makes the Concise and Definitive multifocals, available in sphere and spherocylindrical powers with a sphere range from -20.00D to +20.00D, cylindrical power up to -8.00D in 1° axis increments, up to +3.50D add power in a center-near or center-distance design, optic zones from 8.0mm to 10.0mm, base curves from 7.5mm to 10.0mm and diameters from 13.0mm to 16.0mm.^{6,37}

• **California Optics** makes the CO Soft 55 CL line, which includes the Crescent bifocal custom—a translating bifocal soft contact with an add power of up to +4.00D—as well as the custom bifocal and custom progressive multifocal. All three lenses come in sphere (-10.00D to +10.00D) and spherocylindrical powers (cylinder up to -5.00D) and have four base curves, add power up to +3.50D and adjustable optic zones for the custom bifocal.⁶

• **GP Specialists** (now part of CooperVision) makes the iSight CL line with available sphere powers from -25.00D to +25.00D, an add power of up to +4.00D, and customizable lens diameter (13.0mm to 15.5mm), base curve (8.0mm to 9.5mm) and optic zone (1.8mm to 3.5mm).^{6,38}

• **Metro Optics** makes the MetroFocal, which is available in sphere (-12.00D to +12.00D) and spherocylindrical powers

(cylinder up to -8.00D in 5° axis increments), comes in three different materials, six base curves (8.1 to 8.9) and up to +2.50D add power in a center-distance design.^{6,39}

• **SpecialEyes** makes the 54 Bifocal and Multifocal lenses available in sphere (-25.00D to +25.00D) and spherocylindrical powers (sphere -20.00D to +20.00D and cylinder up to -8.00D in 1° axis increments), both with a highly customizable diameter (12.5mm to 16.0mm), base curve (6.9mm to 9.5mm), optic zone (8.0mm to 10.0mm) and center-near or center-distance design with add powers up to +4.00D in 0.10D increments.^{6,40}

• **United Contact Lens** makes the UCL Bifocal in sphere (-20.00D to +20.00D) and spherocylindrical powers (cylinder up to -3.00D), four base curves (8.3 to 9.2), six sag diameters (1.7mm to 3.2mm) and add powers up to +3.50D. The UCL multifocal is available in sphere (-20.00D to +20.00D) and spherocylindrical powers (cylinder up to -3.00D), three base curves (8.3mm to 9.0mm), variable optic zones (8.0mm to 10.0mm for the sphere only) and add powers up to +3.00D.⁶

• **X-Cel Specialty Contacts** makes the Horizon Bi-con Bifocal and Horizon Progressive, two concentric optics center-near lenses available for spherical and toric correction in three materials, two diameters, base curves from 8.0mm to 9.2mm, a bifocal add from as low as +0.50D to +4.00D (for the bi-con bifocal) and a sphere power range of +20.00D to -20.00D. The lenses are recommended to be fit with a 3mm optical zone for the dominant eye and a 2.5mm zone for the non-dominant eye.^{6,41}

MULTIFOCAL CONTACT LENS OPTIONS

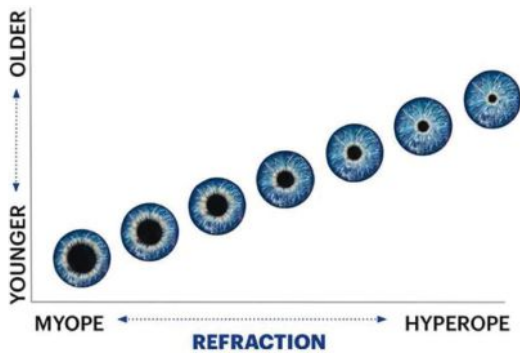


Fig 9. J&J's multifocal design adjusts pupil size not only by age (increasing add power) but also by refractive error.

NaturalVue multifocal was launched in 2015 and recently improved with what VTI calls a “TripleTear lubrication system” and an ultra-tapered edge for better comfort.

MENICON AMERICA

This company is known for its innovative flat blister pack as well as high Dk materials. It has combined these strengths with the Miru 1 day UpSide multifocal. This daily disposable high water content silicone hydrogel (midafilcon A, 91Dk/t, 56% water) multifocal CL has a center-near aspheric design with two add powers.

The innovative “smart touch” packaging allows for a guaranteed correct application that avoids contact of the fingers with the inside of the lens.³⁵ Patients with reduced finger dexterity or those who are unable to tell when the lens is inserted inside-out may benefit from this unique packaging design.

Another multifocal SCL offered by Menicon—Miru 1 month multifocal—is an ultra-high Dk silicone hydrogel (asmofilcon A, 161Dk/t, 40% water) one-month replacement lens available in two center-near aspheric add powers. The unique manufacturing process involves silicone polymerization containing a hydrophilic monomer that produces a smooth surface with nanometer precision, optimizing visual clarity, wettability and resistance to bacterial adherence.^{35,36}

CONCLUSION

After reading about the sheer number of brands and parameters that are available for patients interested in wearing a multifocal SCL, I hope you impress your next hard-to-fit presbyope or astigmat by successfully matching them with one of the many multifocal soft contact lens “players” available. **CCC**

Editor's note: Look for another article in the Jan/Feb 2024 issue by Dr. Stockermans discussing GP multifocals.

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MULTIFOCAL TROUBLESHOOTING

We present several cases and how to manage presbyopia patients while considering their lifestyles and optical needs.

By Nicholas Gidosh, OD

In today's digital age, the majority of people interact with near vision targets and screens on a daily basis. Therefore, it has become critical that their vision correction options meet those demands, whether those are work-related or recreational tasks. Progressive spectacles have become one of the most popular methods of management, offering a stable optic that allows patients to focus on targets at different working distances by looking into different zones of the lens with variable powers. This creates a challenge for contact lenses by comparison, which have the disadvantage of being on the eye. As a result, many commercially available soft lens multifocal options utilize a gradual, aspheric and often center-near multifocal optic.

When someone views a near target, accommodation is stimulated along with the rest of the "near triad" including pupil constriction. Many soft multifocal designs take advantage of this, using a center-near add power to give the patient the ability to focus on that near image.¹ Due to the contact lens being fixed in position on the patient's eye, they are unable to look into a different optical zone to view through a different power and must view the

optics simultaneously; however, this carries a couple inherent design flaws. The first is that the patient does not have the ability to search for a "sweet spot" or zone of the lens where they can find the desired power for the working distance they are viewing. Another issue is that performance of the multifocal is pupil-dependent which leads to problems in suboptimal lighting conditions. The final problem is that, in the case of center-near multifocals, the patient must suppress the bifocal power when viewing at distance and may ultimately find the distance vision a bit blurry. This central distance viewing issue is avoided in the dominant eye with monovision; however, the issue of reduced stereopsis is then introduced.

Another pitfall of monovision is the need for clear vision at three distances far: distance, the intermediate distance of computer screens and near when clear focus can only be given to two of them between both eyes. Additionally, if a soft multifocal decenters on the eye, the optics are displaced, which disrupts the visual axis receiving the desired optical effect.² Specialty contact lenses allow different features of customization to overcome the challenges of these

typical soft multifocal pitfalls.³ The following cases illustrate several different types of designs and troubleshooting methods.

CASE ONE

A 55-year-old woman was looking for contacts to wear for the first time to improve her vision while playing tennis. She typically wore glasses while on the court but found those to be annoying and wanted to try contact lenses. She was offered multifocal correction but initially opted for distance-only vision. However, when she looked down at her watch and phone, it wasn't clear like it was when she wore her glasses, and she found it to be "quite annoying," so she wanted to try multifocals. Her soft lenses were then refit into a multifocal and she was given another two-week trial.

ABOUT THE AUTHOR



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She returned and reported that the distance wasn't as good, making it harder to see the ball. It was then discussed if she would be interested in becoming a full-time contact lens wearer to try a gas-permeable (GP) multifocal, and she agreed to give it a try. Lenses were designed empirically with consideration of her K values, HVID, spectacle Rx, pupil size and eye dominance. Pupils and eye dominance can be particularly important when considering the zone size for the multifocal optics. A center-distance aspheric was designed for her to allow clearest vision at distance. The central-distance zone was about 3.9mm in diameter, just smaller than the 5mm pupil diameter in regular mesopic lighting conditions with an aspheric add zone surrounding.

She appreciated improved distance vision compared to the soft lenses while being able to see her watch and check her phone. She then asked, "Can the up-close be any clearer?" In order to troubleshoot this, eye dominance was confirmed using the sensory method by taking a +1.50 trial lens and blurring each fully corrected eye to determine which was the dominant eye.

She was asked which eye experienced more blur, and reported it was the right eye. Because of this, the right eye was confirmed to be the dominant, so the left lens had the distance zone reduced to 3.5mm where she found improved near vision while maintaining clear vision at distance. Center-distance GP aspherics like this are successful because they allow sharp distance in the center, and the patient can still access the near zone in the periphery especially when they look down.⁴

CASE TWO

Another patient, a 63-year-old male stable keratoconus in OU, presented for a contact lens refit. He had been seen a few years prior but

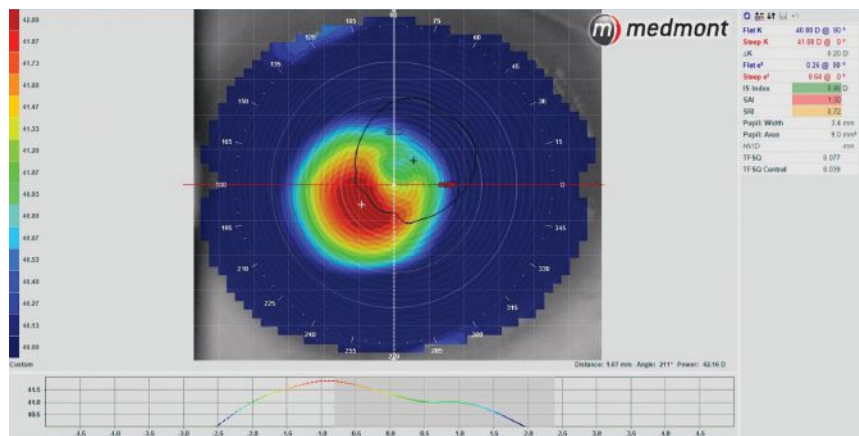


Fig. 1. Here, an axial map was used with a custom scale to show approximately 1.07mm of decentration along the 211° angle, inferior-temporal OD. The scale was set to be 1D steeper than flat K to 1D flatter than flat K.

discontinued contact lens wear from his GPs because he was frustrated, as he was unable to see at near. Topography showed his keratoconus condition to be mild with marginal ectasia, with the steepest part of his corneas only reaching around 45D but showing an inferiorly decentered corneal apex. This indicated he may not have needed an aspheric keratoconic GP design and could potentially find success with a GP multifocal.

With 3D of corneal astigmatism in each eye, initial lenses were selected based on average or mean K and lenses were ordered empirically. The fluorescein showed a touch with flush pattern with the lenses on dispense. He was able to maintain his BCVA of 20/25 OU at distance and was ecstatic with his improved near vision. This is a reminder that our keratoconic and irregular cornea patients are also seeking presbyopic correction later in life and should ask evaluate clinical data to determine if they are reasonable candidates for multifocals.⁵

GP lenses offer customization and great corneal astigmatic correction. One of their primary uses is for patients with corneal irregularity—especially keratoconus—who will also reach presbyopia later in life and

should have their clinical data evaluated to determine if they seek correction. This introduces another issue as keratoconus often causes inferior steepening of the cornea. As a result, GPs will often decenter inferiorly over the apex of the cone when placed on eye. This again introduces the problem of the optics becoming displaced on eye.

Scleral lenses have become extremely popular options for correcting these patients' vision in the past few years. They are excellent for correction of corneal astigmatism and are comfortable lens options for patients, including those with dry eye like many presbyopes. However, like GPs, scleral lenses are fit to be stable on eye with little to no movement and can decenter, often inferior-temporally. As such, many scleral multifocals utilize an aspheric center-near optical system.^{5,6}

CASE THREE

A 57-year-old male with keratoconus returned for his yearly contact lens exam. He was successfully fit with scleral lenses but was becoming frustrated with needing readers. When the option of a multifocal was explained, he was interested in trying it. The problem was that his sclerals showed typical inferior-temporal decentration (*Figure 1*).

A CASE-BASED LOOK AT MULTIFOCAL FITTING

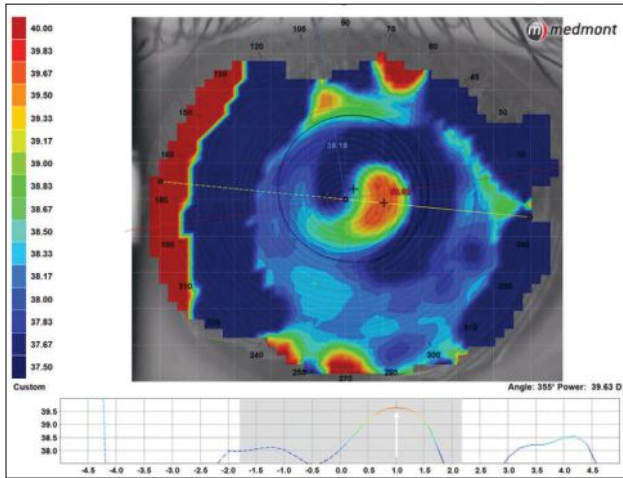


Fig. 2. The condensed topography scale shows a 2.5mm center-near scleral multifocal optical zone that is 1mm decentered temporally on the eye.

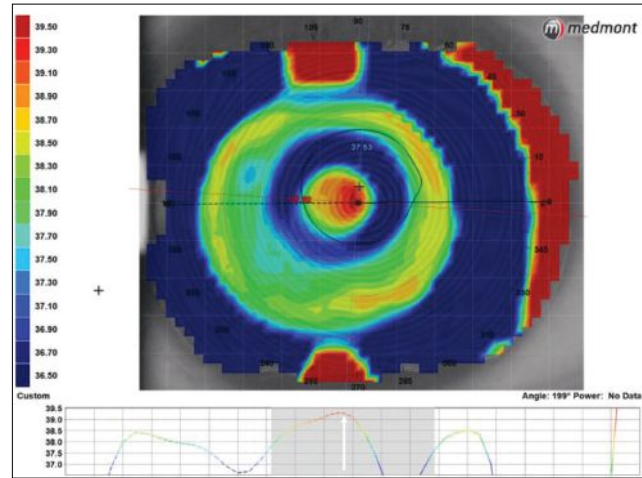


Fig. 3. After adjusting for the decentration measured on the previous lens, labs can realign the optic by decentering the multifocal to better align with the visual axis.

Topography has been shown to be an effective tool in visualizing multifocal optic location with a lens on eye. The best way to visualize this is by compressing the scale of the map to focus on the values in the center of the lens, where the multifocal is located (Figure 2). Labs are now able to purposely decenter the multifocal optic zone to reposition it to the center of the visual axis (Figure 3). This decentration can be measured topographically or through specially marked diagnostic fitting sets.

CASE FOUR

A woman with high myopia presented for contact lens fitting several years ago, seeking better vision than her glasses where she was correctable to 20/40 in each eye at distance. She was fit with GP lenses that gave her 20/20 vision for the first time in years. She was stable for several years when she began to notice blur at near with her contacts.

The patient was initially shown new trials with a monovision set-up, decreasing the power in the nondominant eye by 1.50D to allow some suppression at distance. After a three-week trial period, she returned unhappy with the vision and unable

to adapt to the optics, feeling “thrown off” by them and finding particular difficulty at night. Her lid anatomy was ideal for a translating GP multifocal design since her lower lid rested at the level of the lower limbus.⁷ The Expert Progressive design uses progressive optics while others offer segmented bifocals or trifocals. These designs often feature seg heights to customize where the different optical zones begin and end along with base-down prism and/or truncation techniques to stabilize the lens on the lower lid and aid with translation.⁸

The patient reported crisp 20/20 VA at distance with the first pair of trials. While her near vision was better, she still wasn't overly impressed yet. Slit lamp examination showed the seg lines at three and nine were a little low when they are typically desired to be inside the bottom portion of the pupil (Figure 4). After bringing the seg height up 0.2mm in each eye, she found the near vision much improved.

Another key feature to success in this case was the translation of the lens on eye. The lens should be able to move up to the superior edge of the cornea when the patient looks down; this ensures the patient can access the intermediate and near zones of

the lens. The amount of prism can be adjusted along with the overall fit pattern to allow for the desired translation. Increasing the amount of prism can help if the lens is superiorly decentered, rotates out of position or slips below the lower lid on down gaze.

The amount of truncation can also be adjusted. Minus power lenses have greater edge thicknesses so should not be overly truncated to avoid thinning the inferior edge. Therefore, minus lenses benefit from more prism stabilization while plus lenses, with greater center thickness, can stabilize more from truncation.⁴

CASE FIVE

A 65-year-old woman had a long-established history of GP lens wear, fit over 15 years ago with monovision. She was asked how she feels about her vision while wearing contacts, and she explained that she felt like the vision up-close was okay, not great, with a lot of glare at night and asked if there is there anything that can be done about the glare. There was no sign of any ocular pathology and cataracts only showed trace nuclear sclerotic. She was told that she was a good candidate for multifocals since she was already

a GP lens wearer, and she was fit with a translating trifocal design. This was selected because she had good lower lid anatomy to support a translating lens, and it would still provide an intermediate zone of correction, something lacking in her monovision lenses.^{4,7} The greatest advantage, though, would be a distance zone at the top of the lens to allow sharp distance vision in both eyes, undisturbed by near or multifocal optics. Lenses were ordered empirically where base curve selection depends on the amount of corneal cylinder and a default seg height of the trifocal was selected as 4.7/4mm with a 1.5D base-down prism ballast.

On dispense, the lenses showed good movement and positioning on the lower lid, but the central fluorescein pattern looked a bit flat, showing some mild central bearing in each eye. Her VA was 20/20 at distance and near in each eye, but she reported her vision still seems off. She was recommended to try the lenses for two weeks to aid with adaptation; however, at follow-up, she reported she was really struggling with the distance vision despite how good the near looked.

On closer examination, it was observed that the lenses showed lid grab after blinking that would pull

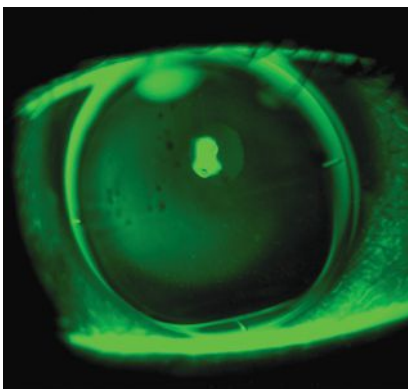


Fig. 4. Translating progressive GP lens. Note the seg lines below the inferior pupil margin indicating the seg height will likely need to be raised for improved near vision.

the lens up, bringing the near zone over the pupil when trying to view at distance. This was determined to be because of the flat-fitting pattern so the lenses were steepened by 0.75D and the seg height was dropped by 0.2mm, reducing it to 4.5/3.8mm (Figure 5). After trialing the new lenses, the patient was thrilled and reported better near vision than she ever had in her contacts and elimination of the glare she had at distance.

TAKEAWAYS

These cases illustrate how specialty contact lenses and their various customization features are useful in satisfying the needs of presbyopic patients. GP multifocals are a good option when the patient is already wearing GPs, seeking the sharpest vision correction available or is open to becoming a full-time contact lens wearer to aid with lens adaptation. Within that category are two options: simultaneous vision aspheric multifocals or translating multifocals.

In order for a patient to be a reasonable candidate for a translating design, their lower lid should be at or just above the lower limbus. Translating lenses have the advantage of providing some of the sharpest vision because of their movement and ability to show distinct powers in various zones.

In the case of custom aspheric multifocals, labs can vary the add power and zone size depending on pupils and eye dominance.⁴ Labs can now also decenter multifocal optics on a lens which is very useful when lenses fail to center on the eye in the case of scleral lenses. Topography has been

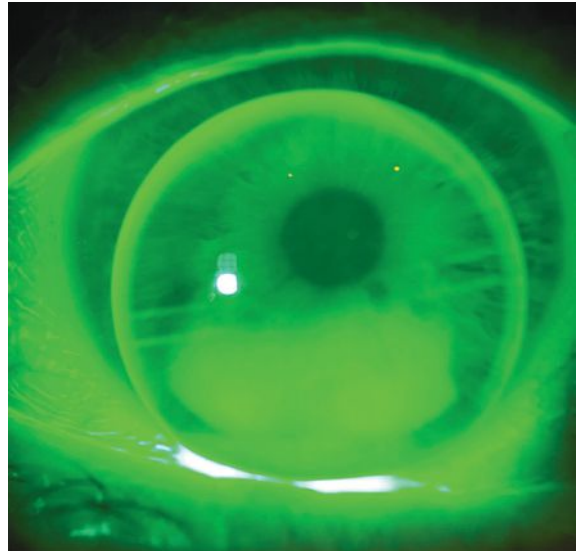


Fig. 5. Seg height was brought down 0.2mm to improve the patient's vision at distance while still allowing easy access to the intermediate and near zones in the translating trifocal optic.

shown to be a useful tool in detecting and measuring this decentration.

Even though the digital world has put additional strain on presbyopic patients, leading to greater visual demand, the contact lens industry continues to advance in technology, offering greater customization to meet these needs. [KCC](#)

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Managing Presbyopia with Multifocal Contact Lenses

Effectively using this modality benefits both patients and providers.

By Erin Rueff, OD, PhD

Presbyopic contact lens wearers offer incredible opportunities for any contact lens practice. Depending on the practice setting, patients in the presbyopic age range may make up more than half of all soft contact lens prescriptions. Even though presbyopic wearers take up the near majority of the contact lens market, only about 60% of contact lens wearers in the presbyopic age range are actually wearing a contact lens that addresses both their near and distance visual needs.¹

There are different possibilities when considering how to address the unique visual demands of a presbyopic contact lens wearer, but as technology continues to improve, it is apparent that multifocal contact lenses are the right option for the majority of presbyopic soft contact lens wearers. This article will explain why multifocals are the best presbyopic soft contact lens option, describe how soft multifocal contact lenses work and present strategies that will lead to successful multifocal lens fittings.

WEIGHING THE PRESBYOPIC OPTIONS

A presbyopic soft contact lens wearer has many options when it comes to correcting their vision at all distances. While single vision contact lenses with overlay reading or distance

glasses might seem like the easiest option, this choice does not allow an existing contact lens wearer to remain spectacle-free. When choosing a contact lens option for a presbyope who wants to address both distance and near vision, eye care providers typically consider monovision or multifocal modalities.

Monovision is a presbyopic correction strategy that uses single vision contact lenses to correct one eye for distance vision and the other eye for a specific near working distance, inducing anisometropia.² When looking at distance, the brain effectively suppresses the near-corrected eye, and vice versa. In theory, this suppression results in binocular acuity that matches the better seeing eye for a particular visual task.³ For the majority of patients, the “dominant” eye is corrected for distance while the “non-dominant” eye is corrected for near vision.²

Because single vision, non-multifocal soft contact lens options were the first commercially available, monovision was the first non-spectacle strategy used to correct presbyopia in contact lens wearers. As multifocal options began to enter the contact lens market, early designs often suffered from reduced vision at all distances due to the manipulation of spherical aberrations (see later section for a detailed description of multifocal optics). Spherical aberrations

can degrade the image on the retina, and this image degradation has been reported to cause blur, decreased contrast sensitivity and glare.⁴⁻¹²

Monovision is preferred by some prescribers because it provides crisp vision at each corrected distance.¹³ There is a perception that this presbyopic modality is simpler and requires less fitting time.¹⁴ The anisometropia induced by this correction type, however, reduces stereoacuity, especially with high add powers.^{4,5,15,16} Due to this reduction in depth perception, monovision is prohibited in certain professions like piloting, professional driving and some competition sports.² Additionally, the two corrected distances typically provide clear

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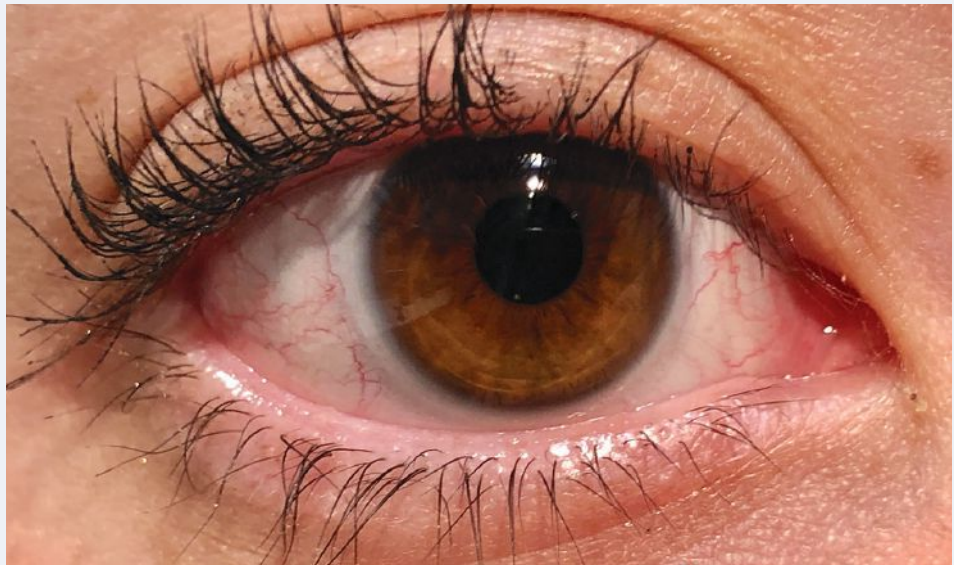
images, but visual targets within those distances may result in reduced acuity.

Multifocal contact lenses theoretically provide clear vision at an infinite number of points from distance, to intermediate to near. Historically, multifocal designs have been described as requiring the patient to “sacrifice” clear vision at one distance in order to achieve acceptable vision at another. As technology has advanced, however, more recent multifocal designs result in distance and near vision that is similar to monovision and also do not affect stereoacuity and depth perception.^{4,5}

MULTIFOCALS OR MONOVISION?

As multifocals have evolved and newer designs have emerged that address the image degradation issues described above, clinicians are often left with the task of choosing a monovision or multifocal option for presbyopic contact lens wearers.

Studies using various multifocal designs have compared multifocals



A patient’s satisfaction with their correction will determine if they stick with their multifocal lenses.

to monovision to determine which modality works best. A 2003 investigation refit existing monovision wearers into a multifocal and showed high-contrast visual acuity was the same at all distances, but stereoacuity was better with the multifocal.¹⁷ Subjective ratings for various distances and tasks were better for the multifocal.¹⁷ One study found that high-contrast visual acuity was no different for either correction and stereoacuity was improved with

multifocals.⁴ An impressive 76% of wearers preferred the multifocal to monovision in this trial.⁴ Other trials have similarly reported better stereopsis with multifocals compared to monovision.^{5,7,18,19}

Other studies have reported more mixed visual acuity results when comparing the two correction types. Some research has reported reduced vision with multifocals only in low-light and/or low-contrast environments, while others suggest

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Educational Objectives: After completing this activity, the participant should be better able to:

- Select the right multifocal contact lens for their presbyopic patient.
- Successfully fit their patients with multifocal contact lenses.
- Educate patients on the benefits of multifocal contact lenses for presbyopia.
- Effectively manage presbyopic patients with multifocal contact lenses.

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MANAGING PRESBYOPIA WITH MULTIFOCAL CONTACT LENSES

objective visual assessment is better with monovision at all distances.^{4,5,7,15,17,20} A more recent study reported that early presbyopes corrected with monovision frequently accommodated with the distance-corrected eye, leaving the near eye with myopic defocus and reduced acuity at near.²¹

The most important factor when assessing the success of any presbyopic contact lens modality is the patient's subjective response. A patient's opinion and satisfaction with their correction is the factor that will determine if they remain in that correction. When considering subjective assessments of multifocal and monovision contact lens designs, patients prefer simultaneous vision multifocals to monovision. In the studies mentioned above, 51% to 76% of patients preferred multifocals to monovision.^{4,7} Subjective ratings of

a multifocal were higher for most tasks and especially for changing focus.^{4,7,15,17}

These findings show that objective visual assessments (*i.e.*, visual acuity measures) of presbyopic contact lens options may not be as valuable as subjective responses. A patient's opinion of the contact lens outside of the exam lane and into their everyday life and activity is likely more important than what line they can read on their eye care provider's carefully calibrated visual acuity chart. It has been suggested that, even if the visual acuity measure is not as good with a multifocal contact lens, the subjective performance of the multifocal in the real world makes the wearer prefer a multifocal design to monovision.⁷ Multifocals, therefore, should be the first-considered option when fitting a presbyopic soft contact lens wearer.

A REVIEW OF MULTIFOCAL OPTICS

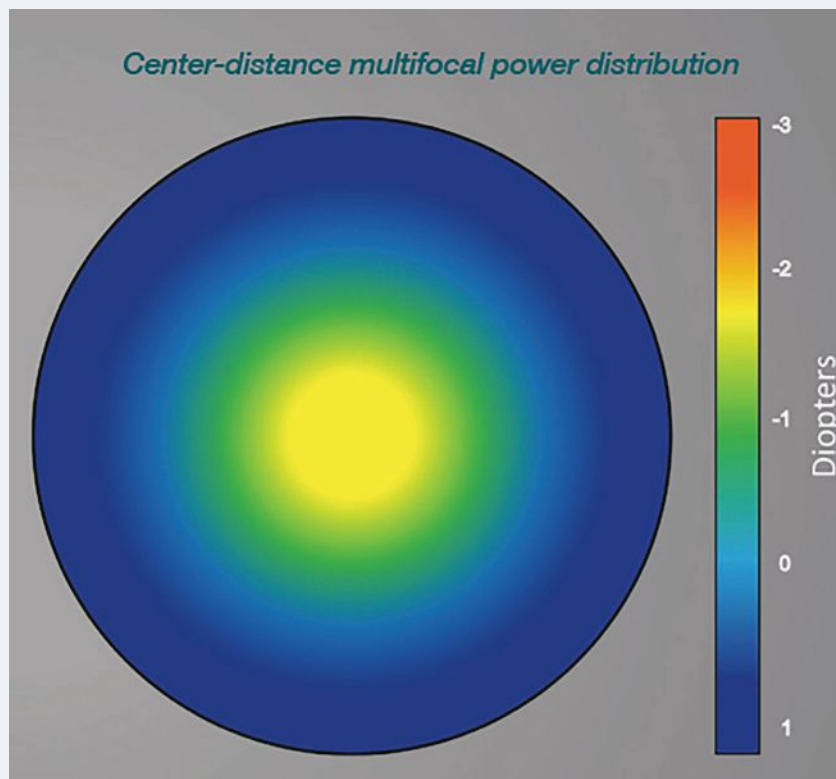
This contact lens option has undergone many changes and technological advances over the last few decades. It is easy to get overwhelmed by the optical jargon that accompanies each individual multifocal design, but understanding multifocal optics does not have to be overly complicated. Most modern soft multifocals on the market employ some sort of simultaneous image optical design.

Simultaneous image multifocals, in general, position distance and near powers over the pupil at the same time. The optical zone that centers over the pupil contains multiple powers that correspond to a range of near and far distances.²² The lens simultaneously focuses multiple images on the retina and the patient attends to the clearest images based on the visual task.²³

Multifocal contact lenses using simultaneous image optics include diffractive, concentric, aspheric and extended depth of focus designs.^{22,24} Concentric designs have small annular zones that contain distance and near power.¹³ Diffractive designs focus distance images by refraction of light and near images by diffraction.²⁵ Extended depth-of-focus designs manipulate the magnitude and sign of higher order spherical aberrations to increase depth of focus (similar to aspheric designs described below) in a manner that will improve presbyopic near and intermediate vision without compromising distance vision as much as previous aspheric designs.^{24,26} Diffractive designs are not currently commercially available and concentric designs only exist in older, less used options.⁶ The majority of extended depth-of-focus multifocal contact lenses currently on the market are marketed for myopia management, not presbyopia.^{27,28}

While understanding that there are different types of simultaneous image

Photo: Keyur Savila



Center-distance multifocal contact lens designs have been suggested to be optimal for early presbyopes and/or presbyopes with high distance vision demands, but center-near designs are the most common option on the market today.

multifocals is helpful, multifocal optics can be easier understood by recognizing that the most prevalent simultaneous multifocals available commercially today use aspheric designs. Instead of having near or distance “zones” like a translating gas permeable contact lens or concentric multifocal design, aspheric designs use spherical aberration to increase the depth of focus and “pseudo-accommodate” for the lacking true accommodation in presbyopes.^{29,30} Similar to how a PAL spectacle lens provides clear vision at more distances than a flat top bifocal, an aspheric multifocal design will offer a similar range of clear vision compared to the distinct distances offered by a translating or concentric contact lens design.

Aspheric multifocals are designed with center-near or center-distance power orientations. Center-near designs add negative spherical aberration and center-distance designs add positive spherical aberration to the center of the lens.³¹ The change in aberrations results in a power profile that gradually changes from near to distance power or vice versa.³¹ This increased depth of focus, therefore, introduces simultaneous distance and near images on the retina.³²

Center-near designs are most common commercially. Because of miotic pupil changes that occur when accommodation is stimulated and the age-related decrease in pupil size, maximal near vision is achieved when the near correction is in the middle of the optical zone.^{33,34} Center-distance designs have been suggested to be optimal for early presbyopes and/or presbyopes with high distance vision demands. Center-distance designs are also used to prevent progression of myopia in children.^{35,36}

STARTING SUCCESSFUL MULTIFOCAL FITTINGS

Now that you recognize the importance of choosing a multifocal option

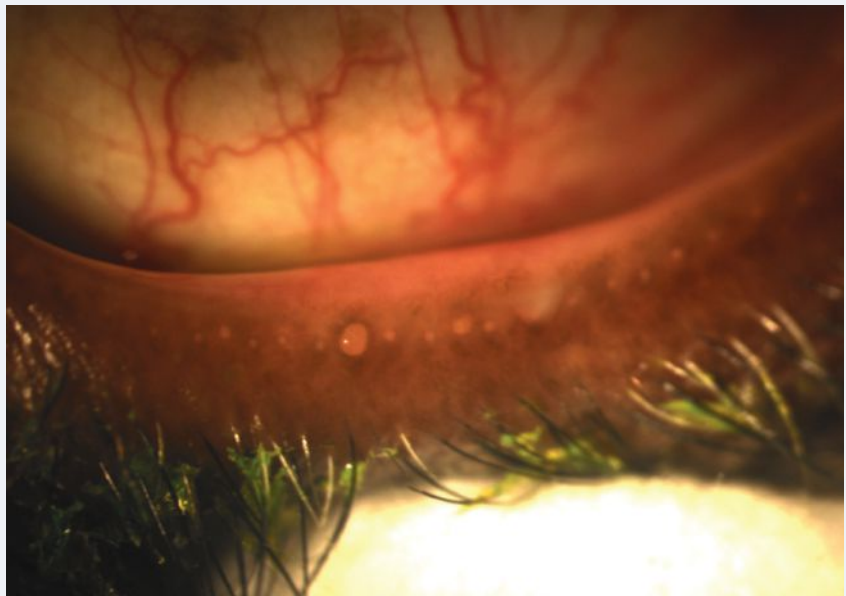


Photo: Doan Huynh Kwak, OD

Manage existing meibomian gland disease or signs of dry eye throughout the fitting process to ensure that any associated symptoms do not interfere with comfort or visual outcomes of the lenses

for your presbyopic soft contact lens wearers, it is important to understand the best approaches for initiating and troubleshooting multifocal contact lens fits. The remaining sections will focus on strategies that will lead you to success with multifocal contact lens fitting.

Before even thinking about lens brand or parameter availability, it is imperative to collect updated and accurate refractive data first. When a presbyope is in the exam chair, it can be tempting to assume that their refractive error is stable and unlikely to have changed since the last exam. It is vital to acknowledge, however, that refractive error can still fluctuate in presbyopic years and small power changes (0.25D to 0.50D) can have a big impact on a patient’s subjective experience with a multifocal.

Additionally, it is common for early presbyopes to “drop minus” or appear to become less myopic as they enter presbyopia, likely because they were over-corrected in their pre-presbyopic years. Add power also changes with time, so verifying optimal add power

at the beginning of each fitting is key. Make sure you begin the multifocal fitting with current, balanced, vertexed refractive data so you are most likely to pull the correct lens power on the first try.

Next, perform a careful ocular health assessment. Presbyopic vision does not occur in a vacuum; ocular health issues like dry eye, pre-existing retinal conditions and ocular medications might influence how the contact lens interacts with the eye and/or what the final visual outcome is. Acknowledging any pre-existing ocular conditions and managing them before the fit can be helpful. For example, existing meibomian gland disease or signs of dry eye could be managed throughout the fitting process to ensure that symptoms associated with these conditions do not interfere with comfort or visual outcomes of the lenses.

Finally, it is time to choose a lens. It might feel daunting to decide which lens to start with and how to initiate the most effective and efficient fitting process. If you are



MANAGING PRESBYOPIA WITH MULTIFOCAL CONTACT LENSES

new to soft multifocal contact lenses, consider starting with one brand or one manufacturer first. Each multifocal design has its own unique nuances, so starting with and sticking to one design will allow you to get comfortable with the lens design and how it can best serve your patients.

Most major contact lens manufacturers maintain the same multifocal optical design across different brands and replacement schedules within their portfolio. This means that you often will have a daily, monthly and/or biweekly replacement option with the same multifocal design, allowing you to use the same optical design for patients with different needs and refractive errors.

FITTING AND FOLLOW-UP

For every multifocal currently on the market, there is a detailed, step-by-step fitting guide developed by the manufacturer that is intended to optimize the chance for initial success with that unique multifocal design. In the past, multifocal fitting sets may have had little to no instruction. Eyecare providers were left to develop fitting strategies and rationales on the spot to determine how to address their patient's visual needs.

Since those early days of multifocal contact lenses, manufacturers have realized that each individual design requires unique steps to achieve good vision at all distances. Fitting guides, therefore, have been developed by testing each design on large samples of patients. Through the fitting guide development, the manufacturer determines what the most effective strategies are for choosing the initial lenses and troubleshooting when patients have visual complaints at various distances. This is incredibly helpful to come up with several logical ways to address patients' specific complaints. The fitting guide will describe the solution that is most likely to address the issue and lead

to success. This expedites the fitting process and ensures more patients will succeed with the lenses.

Once you have trialed the initial lens suggested by the fitting guide, consider sticking with that combination unless vision is very unsatisfactory at distance or near. If binocular vision with the lenses is satisfactory at most distances, acknowledge that vision will likely improve with adaptation (see below) and plan for a follow-up visit to check back in after adaptation. If vision is quite bothersome at one distance or another, however, use the fitting guide to adjust powers appropriately.

ESTABLISH EXPECTATIONS, EDUCATE EFFECTIVELY

The most important step of a successful multifocal contact lens fitting is concise, clear, optimistic patient education. While multifocal contact lens optics have improved and can provide excellent vision at all distances, the complex optics that simultaneous aspheric multifocals introduce can take time to adapt to.

Recent research has shown that multifocal visual acuity and symptoms associated with light disturbances improve over a two-week time period of continued lens wear.^{19,37} This means that, as the patient continuously wears the lenses, the brain and visual system are able to learn how to use the unique optics of the multifocal. It has been suggested that eye care providers will have more success with multifocal

fittings if they prepare their patients for this adaptation process.^{19,37}

Effective multifocal education does not have to involve excessive amounts of chair time. Explain how the lenses work in easy-to-understand language and let the patient know that once they have adapted to the lenses, more meaningful changes and alterations can be made to address any issues they have. Consider the following expectation education example:

“These contact lenses focus multiple images on the back of your eye at the same time, so it will take a little while for your brain to figure out how to use this new lens. It is normal for vision to seem different or slightly altered during the first days of lens wear. Most patients experience improved vision as they continue to wear the lenses. Once you have adapted to the lenses, I can make more meaningful adjustments to the lens power. I am looking forward to hearing your impressions of the lens-

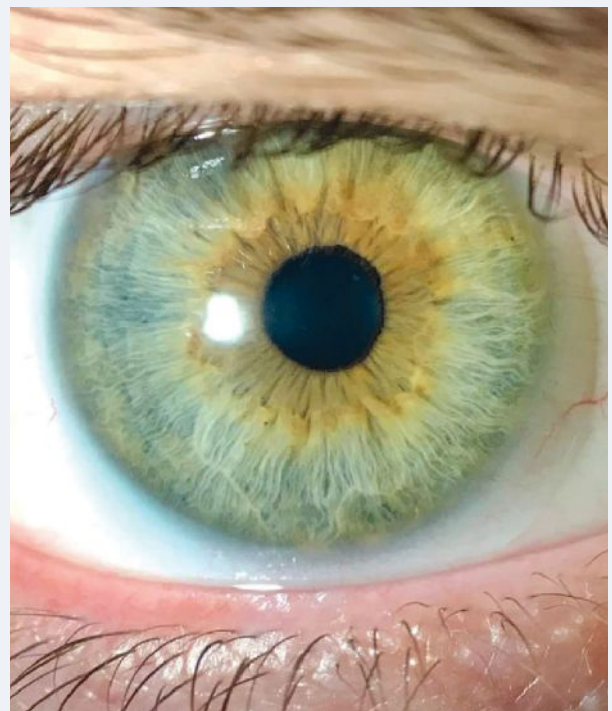


Photo: Alex Nixon, OD, MS, and Erin Rueff, OD, PhD.

Multifocals should be the first considered option when fitting a presbyopic soft contact lens wearer.

es at the follow-up visit and refining anything that might need adjusting.”

This short explanation helps the patient understand the lenses, lets them know what to expect during the adaptation process, and instills confidence and optimism that you can address any issues they have after initial adaptation. This quick education will have a lasting impact on the patient’s attitude toward the overall fitting process, improving your chance for success.

TAKEAWAYS

Presbyopic contact lens wearers have many options for correcting their unique visual needs. The evolution of lens technology over the last several decades has led to optical designs that perform well for most patients. In 2023, we no longer need to settle for overlay spectacles or monovision. Multifocal contact lens designs offer the best option for clear vision at all distances while maintaining stereopsis.

Successful presbyopic soft contact lens wear begins with an eye care provider who is willing and eager to prescribe a multifocal contact lens design, embrace the manufacturer’s recommendations for fitting that lens and thoughtfully educate the patient about the fitting process. **BCA**

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MANAGING PRESBYOPIA WITH MULTIFOCAL CONTACT LENSES

CE TEST - NOVEMBER/DECEMBER 2023

You can obtain CE credit by completing the test form and returning it with the \$35 fee to: Jobson Healthcare Information, Attn: CE Processing, Jobson Healthcare Information, LLC/WebMD, 283-299 Market Street, 2 Gateway Center, 4th Floor, Newark, NJ 07102. To be eligible, return the card within three years of publication. You can also access the test form and submit your answers and payment via credit card at Review Education Group online, www.revieweducationgroup.com.

You must achieve a score of 70 or higher to receive credit. Allow four weeks for processing. For each course you pass, you earn two hours of credit. Check with your state licensing board to see if this approval counts toward your CE requirement for relicensure.

- 1. What percentage of presbyopic contact lens wearers are wearing a presbyopic contact lens modality?**
 - a. 100%.
 - b. 80%.
 - c. 75%.
 - d. 60%.
- 2. Which of the following is TRUE about monovision?**
 - a. It provides clear distance, intermediate, and near vision.
 - b. It reduces depth perception.
 - c. Patients prefer it to multifocal contact lenses.
 - d. It is the most comfortable presbyopic option.
- 3. Before multifocal contact lenses were available, what options did presbyopic contact lens wearers have for addressing their presbyopic vision needs while still maintaining contact lens wear?**
 - a. Single vision contact lenses with overlay spectacles
 - b. Monovision.
 - c. None.
 - d. Both A and B.
- 4. Which of the following could be considered an advantage of monovision?**
 - a. Crisp vision at two distinct distances.
 - b. Clear vision at near, intermediate, and far distances.
 - c. Good depth perception.
 - d. Binocularity.
- 5. In monovision, which eye is typically corrected for near vision?**
 - a. Dominant eye.
 - b. Non-dominant eye.
 - c. Both eyes.
 - d. Either eye, it doesn't matter.
- 6. Which of the following is considered an advantage of multifocal contact lenses?**
 - a. Opportunity for clear vision at all distances.
 - b. Good depth perception.
 - c. Binocularity.
 - d. All of the above.
- 7. Which of the following is TRUE about multifocals:**
 - a. They reduce stereoacuity.
 - b. Vision in modern designs is significantly worse compared to monovision.
 - c. Studies show patients prefer multifocals to monovision.
 - d. They only correct for vision at two distances.
- 8. What factor did the article state was the most important for success with any presbyopic contact lens options?**
 - a. Distance visual acuity.
 - b. Near visual acuity.
 - c. Patient preference/opinion.
 - d. Contrast sensitivity.
- 9. Which of the following is NOT a type of simultaneous image multifocal design?**
 - a. Extended depth-of-focus.
 - b. Diffractive.
 - c. Aspheric.
 - d. Translating
- 10. Which of the following are FALSE about simultaneous image multifocal designs?**
 - a. Diffractive designs are not currently commercially available.
 - b. Most extended depth-of-focus designs are intended for myopia management.
 - c. Aspheric designs are the most prevalent simultaneous image multifocal design.
 - d. Concentric designs are used in some of the newest products on the market.
- 11. What is the most common type of simultaneous image soft multifocal design on the market currently?**
 - a. Concentric.
 - b. Diffractive.
 - c. Aspheric.
 - d. Extended depth-of-focus.
- 12. What optical phenomenon do aspheric multifocals use to increase depth of focus?**
 - a. Accommodation.
 - b. Spherical aberration.
 - c. Trefoil.
 - d. Coma.
- 13. What is the most common power orientation seen in current soft multifocal contact lenses?**
 - a. Center distance.
 - b. Center near.
 - c. Center intermediate.
 - d. No orientation is most common.
- 14. What anatomical feature influences the effectiveness of the power orientation described in the previous question?**
 - a. Miosis during accommodation.
 - b. Diurnal intraocular pressure variation.
 - c. Narrowing anterior chamber angle with age.
 - d. Reduced blink rate when looking at near.
- 15. Which of the following is TRUE when initiating a multifocal fitting?**
 - a. Collecting fresh refractive data at the beginning of each multifocal fit is crucial for success.
 - b. Eye dominance does not matter.
 - c. Patient education can wait until when the prescription is finalized.
 - d. The fitting guide can be ignored unless there is a problem.
- 16. Which of the following is FALSE regarding multifocal contact lens fitting?**
 - a. If you are new to fitting multifocal contact lenses, you should start by trying a new lens brand each time.
 - b. It is important to optimize ocular surface health in order to have a successful multifocal fitting.
 - c. The fitting guide is important for initial lens selection and troubleshooting success.
 - d. Patient education is crucial throughout the entire fitting process.
- 17. Which of the following is FALSE about multifocal fitting guides?**
 - a. Fitting guides expedite the fitting process.
 - b. Fitting guides suggest the most likely option to lead to success when troubleshooting.
 - c. Fitting guides are unique and different for each lens brand.
 - d. Fitting guides are not necessary for successful multifocal fitting.
- 18. Which of the following is TRUE about adaptation to multifocal contact lenses?**
 - a. Vision is typically the best immediately after the lenses are applied.
 - b. Vision at all distances improves over time with adaptation.
 - c. Trialing many different lens powers at the initial fitting results in better vision.
 - d. Full adaptation can occur in a few minutes at the initial fitting.
- 19. When educating a patient on what to expect during the adaptation period, which of the following should be included?**
 - a. Brief description of how lenses work.
 - b. Description of the types of symptoms they might experience while adapting.
 - c. Education that changes can be made at a follow-up visit to refine vision.
 - d. All of the above.
- 20. What step in the fitting process did the article say was most important?**
 - a. Vision assessment.
 - b. Fit assessment.
 - c. Patient education.
 - d. Over-refraction.

Examination Answer Sheet

Managing Presbyopia with Multifocal Contact Lenses

Valid for credit through November 15, 2026

Online: You can take this exam online at www.revieweducationgroup.com. Upon passing the exam, you can view the results immediately and download a real-time CE certificate. You can view your test history any time on the website.

Directions: Select one answer for each question in the exam and completely darken the appropriate circle. A minimum score of 70% is required to earn credit.

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Payment: Remit \$35 with this exam. Make check payable to Jobson Healthcare Information, LLC.

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Processing: There is a four-week processing time for this exam.

Answers to CE exam:

1. (A) (B) (C) (D)
2. (A) (B) (C) (D)
3. (A) (B) (C) (D)
4. (A) (B) (C) (D)
5. (A) (B) (C) (D)
6. (A) (B) (C) (D)
7. (A) (B) (C) (D)
8. (A) (B) (C) (D)
9. (A) (B) (C) (D)
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14. (A) (B) (C) (D)
15. (A) (B) (C) (D)
16. (A) (B) (C) (D)
17. (A) (B) (C) (D)
18. (A) (B) (C) (D)
19. (A) (B) (C) (D)
20. (A) (B) (C) (D)

Post-activity evaluation questions:

*Rate how well the activity supported your achievement of these learning objectives:
1=Poor, 2=Fair, 3=Neutral, 4=Good, 5=Excellent*

21. Select the right multifocal contact lens for their presbyopic patient. (1) (2) (3) (4) (5)
22. Successfully fit their patients with multifocal contact lenses. (1) (2) (3) (4) (5)
23. Educate patients on the benefits of multifocal contact lenses for presbyopia. (1) (2) (3) (4) (5)
24. Effectively manage presbyopic patients with multifocal contact lenses. (1) (2) (3) (4) (5)
25. Based upon your participation in this activity, do you intend to change your practice behavior? (choose only one)
 - (A) I do plan to implement changes in my practice based on the information presented.
 - (B) My current practice has been reinforced by the information presented.
 - (C) I need more information before I will change my practice.
26. Thinking about how your participation in this activity will influence your patient care, how many of your patients are likely to benefit? (please use a number):
27. If you plan to change your practice behavior, what type of changes do you plan to implement? (check all that apply)
 - (a) Apply latest guidelines (b) Change in pharmaceutical therapy (c) Choice of treatment/management approach
 - (d) Change in current practice for referral (e) Change in non-pharmaceutical therapy (f) Change in differential diagnosis
 - (g) Change in diagnostic testing (h) Other, please specify: _____
28. How confident are you that you will be able to make your intended changes?
 - (a) Very confident (b) Somewhat confident (c) Unsure (d) Not confident
29. Which of the following do you anticipate will be the primary barrier to implementing these changes?
 - (a) Formulary restrictions (e) Lack of interprofessional team support
 - (b) Time constraints (f) Treatment related adverse events
 - (c) System constraints (g) Patient adherence/compliance
 - (d) Insurance/financial issues (h) Other, please specify: _____
30. Additional comments on this course: _____

Please retain a copy for your records. Please print clearly.

First Name

Last Name

E-Mail

The following is your: Home Address Business Address

Business Name

Address

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Rate the quality of the material provided:

1=Strongly disagree, 2=Somewhat disagree, 3=Neutral, 4=Somewhat agree, 5=Strongly agree

31. The content was evidence-based.

- (1) (2) (3) (4) (5)

32. The content was balanced and free of bias.

- (1) (2) (3) (4) (5)

33. The presentation was clear and effective.

- (1) (2) (3) (4) (5)

By submitting this answer sheet, I certify that I have read the lesson in its entirety and completed the self-assessment exam personally based on the material presented. I have not obtained the answers to this exam by any fraudulent or improper means.

Signature _____ Date _____

Lesson 124405, RO-RCCL-1123

Stop, Drop and Roll with It

Keratoconus will result in corneal hydrops in about 3% of patients. Here's how to move forward when it's encountered.

A 25-year-old established patient called due to new onset blurry vision in the left eye. He had long-standing keratoconus (KC) and wore sclerals. He denied sleeping in lenses, wearing old ones or any other acute change to normal wear. He reported his eye was slightly red, irritated and experienced mild light sensitivity; he denied any discharge. The patient was triaged, told to remove his lens and asked to come in for a visit. Based on his symptoms, my top three working differentials were infectious keratitis, acute corneal hydrops and uveitis.

CASE

In office, his ocular history included advanced KC and a history of wearing rigid gas permeable lenses, more recently switched out for sclerals in both eyes. The patient suffered from mild dry eye syndrome OU. He denied any prior ocular surgery or trauma and had no contributory medical history. He also had no noted allergies or family ocular history. Currently, he is using preservative-free artificial tears as needed in both eyes.

The patient's entering acuity without lenses or glasses was 20/200, pinhole 20/40 OD and 20/250, pinhole 20/100 OS. Intraocular pressure (IOP) was 17mm Hg OD, 21mm Hg OS. Confrontation visual fields were full in both eyes. Pupils revealed no relative afferent pupillary defect in either eye and extraocular muscles were full. Pachymetry reading were 550µm OD, unable OS. Slit lamp examination was unremarkable OD, but a protective ptosis was revealed OS. The conjunctiva and sclera had diffuse injection OS. Corneal slit

lamp exam showed inferior conical protrusion with a focal area of inferior corneal edema. Overlying microcystic edema and bullae were seen, as was an intact epithelium. No infiltrates or keratic precipitates were seen, anterior chamber was deep with no cells observed and iris architecture was normal and the lens was clear.

The patient was diagnosed with acute corneal hydrops in the setting of KC. Other differential diagnoses were infectious keratitis, autoimmune keratitis, Fuchs' corneal endothelial dystrophy, iridocorneal endothelial syndrome, posterior polymorphous corneal dystrophy and others.

He was ordered to halt lens use temporarily and started on prednisolone QID, Muro 128 drops (sodium chloride 5%, Bausch + Lomb) QID and cyclopentolate BID; a bandage contact lens was placed to help with comfort. An IOP-lowering drop was considered due to borderline IOP from inflammation but was not prescribed. Over the next month, the patient gradually improved and so did his vision. He was left with scarring and some contour irregularity where the hydrops were, but was able to start back into scleral lenses and regain 20/40- in the affected eye.



Residual scarring after corneal hydrops.

CORNEAL HYDROPS

The etiology of acute corneal hydrops is a breakdown of Descemet's membrane (DM) in the setting of advanced corneal ectasia. The rupture happens from stretching of the DM; once this occurs, aqueous enters the corneal stroma and epithelium. The term "hydrop" refers to the abnormal fluid accumulation. Acute hydrops occur in roughly 3% of KC patients. The average onset is around 25 years of age, affecting more men than women. These patients often have an associated history of eye rubbing, seasonal allergies and advanced corneal ectasia.¹ The most common cause of DM detachment is not acute corneal hydrops, but an association with intraocular surgery.

When hydrops also has focal corneal edema, it is indicative of failure of the DM's barrier function, causing fluid consumption by the overlying corneal stroma. Most cases of acute hydrops resolve on their own over two to four months. Final outcomes vary, depending on amount of swelling and time taken to resolve. Patients can be left with a range of corneal neovascularization and corneal scarring.² Symptoms and signs to look for include corneal edema, often associated with decreased visual activity, epiphora, photophobia, injection and pain.

In office, slit lamp photos are recommended for documentation and monitoring purposes. Anterior segment OCT is also beneficial to understand the location and extent of corneal edema and the magnitude of DM breakage. The mechanism of repair for DM involves reattachment of the DM and endothelial migration. When the DM ruptures, it often coils and retracts. Therefore,



Photo: Steven Sorokin, OD

the first part of healing involves the DM reattaching to the posterior stroma; this period can vary depending on the severity of the break. Then, the endothelium has to migrate to close the gap between the broken DM edges and produce a new DM.^{3,4}

TREATMENT

Options for managing hydrops can range from observation to more extreme modalities. Traditional treatment involves medical therapy similar to the patient above. Hypertonic sodium chloride is prescribed to reduce epithelial edema and cycloplegia can be prescribed for patient comfort, but a cycloplegic agent is not always given. Topical steroids are controversial, thus not prescribed by all. In this case, steroids were prescribed to help reduce inflammation and hopefully prevent further neovascularization formation. The bandage contact lens was large diameter (>16mm), placed for patient comfort, but varying sizes can be used for improved relief.

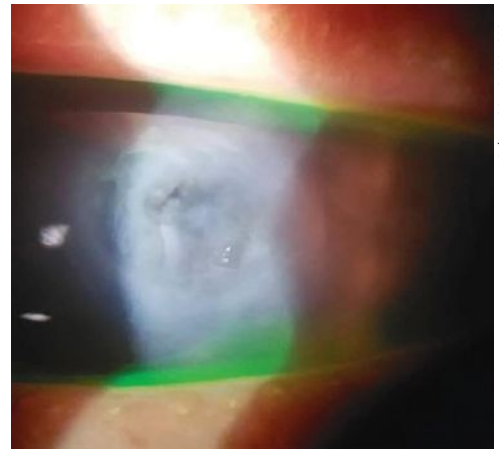
There are alternative management options for acute hydrops that involve comanagement with an ophthalmologist. Around 15 to 20 years ago, pneumatic descemetopexy was introduced to tamponade the DM break. This procedure involves placing an air or gas bubble in the anterior chamber to plug the break; this is thought to reduce the resolution time of edema. Through quickened recovery, this likely reduces the period of discomfort and decreased vision while also reducing the risk of visually significant scarring.⁵ One study found corneal edema in nine patients treated with pneumatic descemetopexy lasted on average 20 days, while 21 non-treated patients had an average of 65 days until resolution. They also

found those treated with the intracameral air were able to return to their hard contact lenses in a quarter of the time of the control group. Once the edema had resolved in both groups, they did not find a difference in best-corrected visual acuity.⁵

The injection of air or gas can reattach the DM to the posterior stroma; however, it does not aid in the migration and creation of new DM by the endothelium. Compression sutures are thought to help with reattachment and hold the edges of the tear close, which would enable endothelial cells to seal more rapidly.³ Consequently, several groups in the literature report using an air bubble in combination with sutures added through the DM to more tightly adhere to the stroma after hydrops.⁶

Surgeons have the choice between choosing air and gas when performing pneumatic descemetopexy, with the decision often based upon the amount of time needed to repair the defect in DM. Air lasts the least amount of time, ranging from two to three days, which can result in the patient needing a repeat bubble placement. Conversely, sulfur hexafluoride (SF₆) normally lasts around seven to 10 days, which is sufficient for healing of DM.⁵ To date, there has not yet been a study published finding that performing a pneumatic descemetopexy reduces the need for corneal transplantation.⁶

A last resort option for these patients is penetrating keratoplasty (PK). Other transplants like deep anterior lamellar keratoplasty are not commonly performed due to the difficulty of separating DM from the posterior stroma. The data for PK post-hydrops does not show



A case of an acute corneal hydrops.

a difference in graft survival because of previous episodes for acute corneal hydrops. An increase in graft rejection is believed to be due to the inflammation that usually accompanies hydrops.⁴

Acute corneal hydrops can be devastating to corneal ectasia patients. Identifying them and starting proper treatment can assist in a better visual outcome long-term. Often, these patients can return to their hard contact lenses with sufficient vision, but in severe cases, more aggressive treatment is necessary. **lcc**

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A Rough Patch

This rare disorder can cause Bitot spots without an underlying vitamin A deficiency.

A 12-year-old male was referred with a history of chronic blepharoconjunctivitis, stating that his eyes are intermittently red and painful. His parents noticed a “globule” next to his right temporal cornea. His previous doctor treated him with Tobradex, which would improve his symptoms, but his discomfort returned upon cessation.

His history is significant for Jacobsen syndrome (chromosome 11 deletion disorder, affecting about 1 in 100,000), which causes heart disease, frequent infections, facial/skeletal abnormalities, GI tract problems, kidney malfunction and developmental delays. He did not have a history of atopic disease.

He was noted to have 20/20 vision in each eye. He had mild inspissation of all meibomian glands as well as significant lagophthalmos. His corneas were clear

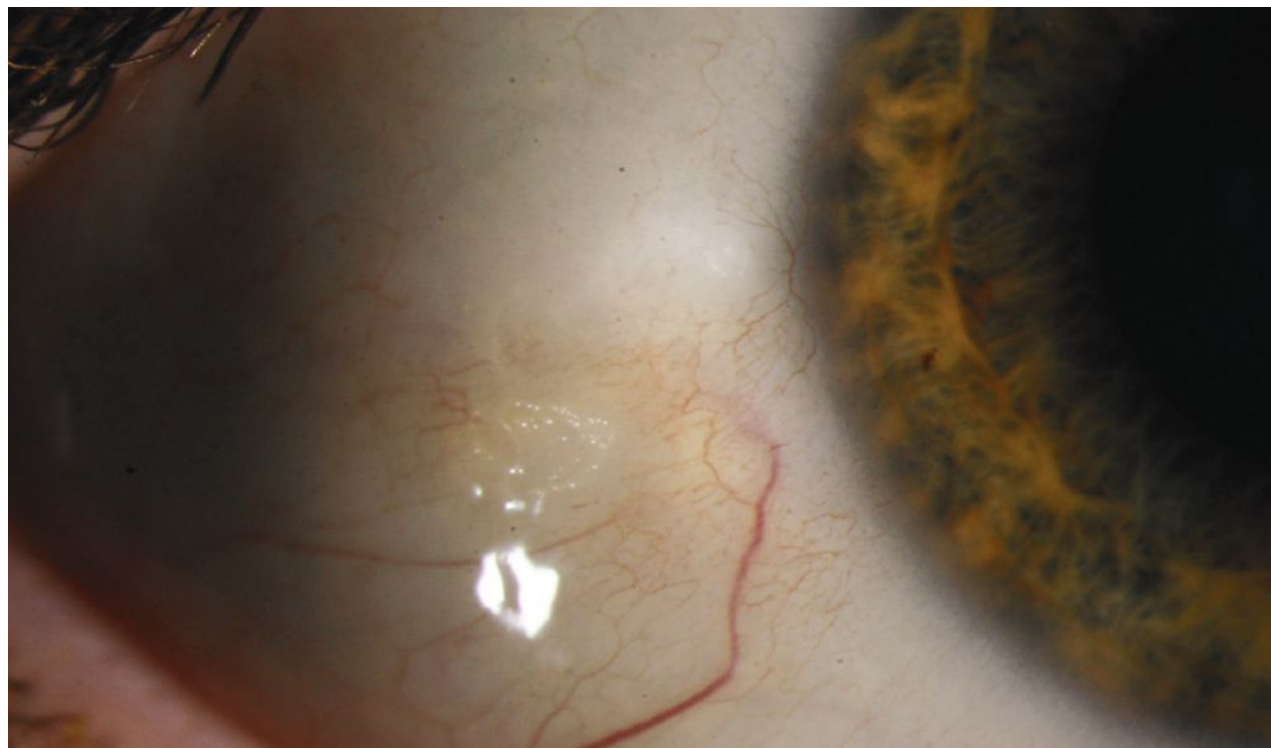
centrally with anterior stromal scarring at the nasal limbus in the right eye, with adjacent conjunctival hyperemia. A Bitot spot was noted on the temporal conjunctiva of the right eye.

Our patient was diagnosed with conjunctival xerosis; serum vitamin A levels were ordered. He was started on prednisone drops TID with a one-month taper. He was recommended ointment and occlusion at bedtime and preservative-free lubrication during the day.

A Bitot spot is a superficial buildup of keratin and loss of goblet cells on the conjunctiva, located in the exposure zone. They are classically associated with vitamin A deficiency; however, they may be associated with other vitamin deficiencies and exposure patterns. Our patient did not have vitamin A deficiency, but did improve with decreased exposure and intense lubrication.

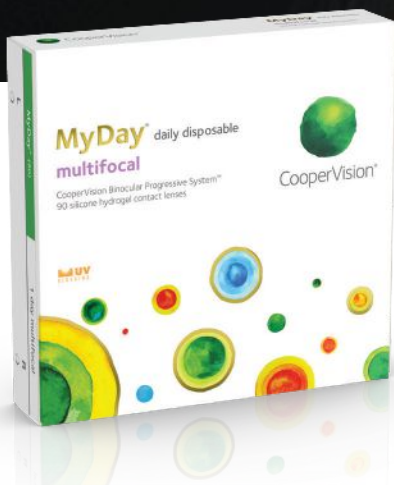
A recent case series reported Bitot-like spots with lab-confirmed normal serum vitamin A levels. They found the spots indistinguishable both clinically and histopathologically from classic Bitot spots. These spots were noted to occur in a range of anterior segment pathologies, including aniridia, WAGR syndrome, Axenfeld–Rieger syndrome, and blepharokeratoconjunctivitis. Vitamin A deficiency–related Bitot is more likely to be bilateral, while other causes may have unilateral presentations.

Vitamin A serum workup is essential, since low levels could lead to nyctalopia, corneal ulceration or keratomalacia. Treatment of exposure-related conjunctival xerosis includes steroid/antibiotic bursts, lubricating drops/ ointments, amniotic membrane, bandage soft/ scleral lenses, tape/surgical tarsorrhaphy and moisture chamber goggles. [RxCL](#)



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REFERENCES: 1. Kingston AC, Cox IG. Predicting through-focus visual acuity with the eye's natural aberrations. *Optom Vis Sci*. 2013;90(10):1111-1118. 2. Data on file. Bausch & Lomb Incorporated. Rochester, NY.

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