Hybrid Lens Basics

By Lindsay A. Sicks, OD, FAAO

A “hybrid” is something made by combining two different elements together. In contact lenses, a hybrid lens is a gas permeable (or rigid) lens center surrounded by a soft skirt portion. Current generation hybrid lenses are a great way to provide patients with the crisp vision a gas permeable (GP) lens can provide while also maintaining the initial comfort of a soft contact lens.

History

Hybrid lenses are not a new concept – however, the newest generations of these lenses have only been in regular use for the past decade or so. The original hybrid lenses were conceptualized in 1977 by Erikson and Neogi, right around the same time that gas permeable lens materials were being developed to replace PMMA (polymethyl methacrylate). The pair developed a cross-linking concept that combined PMMA and HEMA (poly-2-hydroxyethyl methacrylate) materials to create the hard center and soft skirt, respectively. The rights to this intellectual property were acquired by the Precision-Cosmet company.

From there, the company searched for an improved center material that was gas permeable (i.e. not PMMA). In 1980, pentasilicon P was developed. A proprietary bonding technology using pentasilicon P was also developed with an accompanying manufacturing system in 1981. The contact lenses needed to pass through the FDA approval process prior to being manufactured and pre-market approval status was granted in 1985.

The first hybrid lenses were marketed in 1985 as the Saturn II lens by Precision-Cosmet. The lenses were fit from an 11-lens diagnostic set and had a 13.0mm overall diameter with a 6.5mm center portion. They were approved for daily wear with annual replacement. The lens center was made of the aforementioned pentasilicon P material with the skirt composed of a hydrophilic HEMA material – synergicon A. In 1986, the technology was purchased by Sola/Barnes-Hind who continued the manufacture and marketing of Saturn II.

Ciba Vision began to market the SoftPerm hybrid lens in 1989. A re-design of the Saturn II, the new lens boasted new manufacturing technology and improved edge lift for more lens movement. Still, these early generations of hybrid lenses were fraught with complications such as corneal neovascularization, poor tear exchange and tearing of the lens at the junction of the soft and GP portions. In June 2010, the SoftPerm was discontinued. Practitioners were encouraged to re-fit patients into the newer hybrid technology marketed by SynergEyes.
Around 2005, SynergEyes began marketing a new generation of hybrid lenses starting with the SynergEyes A lens. Their first generation began with so-called “Hyperbond” technology – the goal of which was to eliminate issues with tearing at the lens junction. The lenses also boasted a highly oxygen permeable center material and a HEMA skirt. Later, multifocal (SynergEyes M), keratoconic (SynergEyes KC) and post-surgical (SynergEyes PS) designs were developed. In 2009, a new reverse geometry design of keratoconic hybrid lens was developed – the SynergEyes ClearKone lens.

In 2010, the 2nd generation of SynergEyes hybrid lenses were launched. The biggest change was the addition of a silicone hydrogel (as opposed to the previously used HEMA hydrogel) skirt material. This helped eliminate worries about the oxygen transmissibility of previous designs and reduced the risk of corneal neovascularization with the lenses. The new designs were made for the regular cornea and the single vision version is called the Duette lens. The Duette Multifocal was also made available during this time. In 2015, the Duette Progressive was launched as an alternative multifocal design.

**Advantages of Hybrids**

As mentioned previously, the hybrid lens has the advantage of providing crisp optics of a rigid or GP lens due to the configuration of the lens center material. The comfort of a soft skirt also allows for good initial comfort. The lenses also have the tendency to center well due to the large overall diameter, providing stable vision in both astigmats and presbyopes. For the irregular cornea, the lens will provide good optics by vaulting over any corneal irregularity present while maintaining the centration induced by the soft lens skirt.

The newest SynergEyes lenses also provide sun protection within the lens. There is Class II UVA and UVB blocker in the lens materials used for manufacture.

**Patient Selection**

For a Duette hybrid lens, the best candidates have a regular cornea and some amount of astigmatism. It is great for those with a high visual demand as the GP center corrects for corneal astigmatism. Candidates may be current soft toric wearers unhappy with the comfort or instability of vision due to lens rotation or undercorrection. If the patient is presbyopic (needing reading glasses), they may be considered for the Duette Progressive design. The Duette Progressive is a simultaneous vision design with a choice of three add powers. It is a great lens for the astigmatic presbyope, especially if they have discomfort or vision issues with their habitual soft multifocal or soft toric multifocal lens designs. Athletes are also great candidates for hybrid lenses. They are able to wear the lenses for sports without risk of dislodgement and rotation is non-contributory to vision stability.

It is important to note that great candidates for hybrid lenses follow many of the tenets one would assess while determining candidacy for a gas permeable lens. The ideal candidate has a spectacle prescription with low to moderate astigmatism, keratometry readings in a similar magnitude and direction to the refractive cylinder and a residual cylinder that is low or zero.

For the UltraHealth line of lenses, the best candidates are those with irregular corneas. These patients may have corneal diseases such as keratoconus (a thinning and protruding cornea), or have had a corneal transplant. If the patient has had refractive surgery, they may be a better candidate for the
UltraHealth FC, which is an oblate design that is more consistent with the shape of the cornea after such a surgery.

In addition to the above guidelines for candidacy, any patient who is into the latest in technology or enjoys trying new things would be a great candidate for the Duette line of lenses.

**Lens Application: In-Office**

For ease of handling upon application, there are a few methods to consider: 1. the two-finger method, 2. the tripod method, or 3. the suction cup method.

As with application of any contact lens, be sure to wash your hands thoroughly and dry them with a lint-free towel prior to handling. You should also inspect the hybrid lens for any cracks in the center and for folds or tears in the skirt prior to application. Rinse the lens with the chosen solution and prepare for application using one of the methods mentioned above.

For a hybrid lens for the regular cornea, all you need are a couple drops of compatible solution in the bowl of the lens for comfort prior to application. The small amount of solution may also help prevent application bubbles which can be uncomfortable for the patient.

For an irregular cornea hybrid lens, the application is a bit different. The suction cup method is most often used for application because the amount of fluid necessary in the lens bowl is greater and so the suction cup provides the most stability. This lens is filled up with fluid rather than applying just a couple drops. The irregular corneal hybrid design needs fluid under the GP portion of the lens to mask the corneal irregularity and provide the best vision.

The recommended solution for filling this lens is preservative free saline, such as Unisol 4 (Alcon). In our office we use vials of the 0.9% sodium chloride preservative-free inhalation solution typically used in nebulizers. The solutions are easily prescribed and obtained by patients and contain no buffers. They are also easily packed in single use vials in boxes of one hundred units and avoid the contamination risk that a multi-use non-preserved solution can present. To avoid bubbles upon application, fill the lens bowl completely with the non-preserved saline solution, creating a convex meniscus of fluid at the top of the lens.
When fitting diagnostically, sodium fluorescein is instilled in the lens bowl prior to application to ensure the proper fit and alignment as directed by the fitting guide. Regular sodium fluorescein is used, as opposed to the high molecular weight variety, as the skirt is silicone hydrogel and will not stain with use of this standard type of dye. Be sure to clean the lens thoroughly after use in diagnostic fitting.

You can also prepare the patient ahead of time with the expectation that there will be some initial lens awareness with any hybrid lens design. Many of the patients being fit in this lens are either new to lens wear or are adapted to wearing soft hydrogel lenses with a low modulus (or stiffness). When these new lenses are applied there can be some lens sensation, but this typically diminishes over the first week of wear.

**Lens Evaluation**

The perfect fit of a regular cornea hybrid lens will show excellent centration, full coverage, and approximately 1.0mm of movement on blink. When assessing centration, be sure that the GP portion of the lens is centered over the pupil. Any amount of decentration of the GP center can affect overall vision and satisfaction. If decentered, you will need to troubleshoot the fit to improve centration. If there is insufficient movement with the initial empirical lens ordered, you can flatten the skirt portion of the lens and re-order.

Because the GP portion of the lens is fit on flat K, as long as the lens has adequate movement (approximately 1.0mm) the fit will be adequate for wear. This is also the reason no sodium fluorescein is required to assess the lens fit. It is important to ensure the lens has the same amount of movement at the end of the day, so these patients will return for a follow-up visit within 1-2 weeks after the initial lens dispense.

When assessing the fit of a hybrid lens for the irregular cornea, sodium fluorescein should be instilled into the bowl of the diagnostic lens prior to application. Three to four minutes after application is the ideal time to assess the fluorescein pattern and lens fit. A wratten filter held in the path of returning light and not in the path of the incident light on the slit lamp will enhance the contrast of the fluorescein pattern significantly. You are aiming for clearance over any irregularity and thinning of the fluorescein pattern at the inner landing zone (outer portion of the GP lens) without excess pooling or bearing. You still want free movement of the lens and good comfort for the patient.

Once the irregular cornea hybrid lens has been dispensed, the patient does not need to continue to instill fluorescein into the lens for application (this is for in-office assessment only). These lenses are also
seen for return follow-up visits, typically within 1-2 weeks to ensure the lens continues to show adequate clearance centrally and adequate movement on blink.

**Lens Removal**

To remove a hybrid lens, the patient most often looks up while the clinician “pinches” the soft skirt of the lens with their fingers. The action is like removing a soft contact lens from the eye, however, you may need to use a narrower pinch action. A nice analogy that you can use with patients learning removal of their own lenses is that removing a hybrid requires a pinch like what you might use to remove a piece of lint from your sweater. Dry fingers are also imperative for successful removal. If the fingers are not completely dry or the patient is tearing, this task can be difficult or nearly impossible. The challenge can be overcome in a few ways: 1. “Air dry” the eye by having the patient hold their eye wide open for 5-10 seconds prior to attempting removal, 2. Gently dry the edge of the skirt (only in the area being touched) with a tissue prior to removal. In the unlikely event that both of these strategies fail, one could apply finger cots to the two fingers used for removal for extra grip. One could also have the patient look down and remove the lens with the pinching motion from the superior aspect of the soft skirt.

**Lens Application and Removal: Teaching Patients**

When teaching patients to apply their own lenses, I always advise that they lay down a clean lint-free towel and a mirror on their workspace. They should wash their hands with a mild, lotion-free soap and dry their hands thoroughly with a lint-free towel.

Next, the patient will lean forward and look down at the floor. They should use the dominant hand to pull up on the upper lid. It helps to place the fingers at the base of the lashes rather than above them. With their palm facing up, the inserter or fingers holding the lens and fluid are moved toward the eye. The lower lid should be pulled down using a finger on the hand holding the lens (non-dominant hand). Gently place the lens on the eye. Some of the fluid may displace onto the towel or floor. It is very important not to push the lens too forcefully onto the eye.

When training patients on lens removal, again direct them to wash and dry their hands as before. Then, using their dominant hand, they will pull back on the upper lid below the lash line. Using the other hand, they will pull down gently on the lower lid. With dry fingers, the patient will pinch the bottom of the soft lens skirt at the five and seven o’clock positions – similar to removing a piece of lint from a sweater. They should apply a firm enough pinch to cause the bottom edge of the lens to buckle so that air is allowed beneath the soft skirt. This will allow the lens to release from the surface of the eye.

Application and removal videos for each of these lenses are available on the SynergEyes manufacturer’s website. There are also printed brochures available to assist with the explanation and send home with patients for review.

**Lens Care**

Compatible solutions for care of SynergEyes Duette hybrid lenses include: Clear Care (Alcon), Complete (AMO), Biotrue (Bausch + Lomb), and Renu Fresh (Bausch + Lomb). The manufacturer also recommends addition of a daily cleaner approved for both soft and GP contact lenses. In our office we recommend
daily use of Sof/Pro2 (Lobob) after removal with good results. Be aware that the OptiFree PureMoist (Alcon) product has had some compatibility issues with the lenses including filming and is not the

solution of choice at this time. Also, Peroxiclear (Bausch + Lomb), an alternative peroxide system, is also not recommended specifically at this time.

For care of the SynergEyes UltraHealth line of lenses, the manufacturer recommends preservative-free solutions. The recommended disinfecting system is Clear Care (Alcon). The patient will use non-preserved saline solution, such as Unisol 4 (Alcon) to apply the lenses.

For re-wetting purposes with any of the hybrid designs, the manufacturer recommends use of agents approved for use with both soft and GP lenses. One such example is Blink Contacts (AMO).

**Lens Ordering**

SynergEyes Duette lenses for the regular cornea can be ordered empirically, meaning no diagnostic lens kit is necessary to fit the lens. You can simply call the company with the patient’s keratometry readings and spectacle prescription to place an order. Alternatively, you can point your browser to their calculator website (http://duettecalculator.com) for direct access the online fitting calculator. In the window you can input the keratometry and prescription for each eye and the ideal lens is calculated. The calculator will also tell you if the necessary lens is out of range of available parameters and if the patient’s prescription contains an amount of residual astigmatism that will make them a less than ideal candidate for the Duette lens.

As with more irregular cornea lens options, a diagnostic fitting set is required for a SynergEyes UltraHealth or UltraHealth FC fit. Once an adequate fit is obtained with a diagnostic lens and over-refraction is performed, the initial lens can be ordered.

**Practice Management**

The latest generation of hybrid lens designs are meant to be replaced every six months. When you place the initial lens order as a single vial you can then return to the order within the next few weeks to place the “2-pack completion” order for your patient. The patient will then have a total of two lenses per eye for the annual supply and does not need to return to the office in six months to re-order. There is an area on the side of the box where you can mark the month of replacement as a reminder. Replacement single vial lenses can be purchased throughout the year, if needed, through your office.

Hybrid lenses are a great practice builder in that the product cannot be purchased at online outlets. You can retain the patient sale and continue to provide needed follow-up and encourage appropriate replacement intervals. It is also a way to elevate your practice and offer the latest technology that the practice nearest you may not have. When starting to fit these lenses, doctors may wish to undergo some additional training offered by manufacturers to become certified in fitting so that the process is relatively smooth from the start to further your knowledge of each lens design and assist with fitting, evaluation and training of patients.
About our Author

Dr. Lindsay A. Sicks graduated from the Illinois College of Optometry in 2010 and then completed a residency in Cornea and Contact Lenses at Northeastern State University Oklahoma College of Optometry. She currently holds a full-time appointment at the rank of Assistant Professor at ICO, where she is involved in patient care and research in the Cornea Center for Clinical Excellence. Dr. Sicks is a Fellow of the American Academy of Optometry and a member of the Association of Optometric Contact Lens Educators. She coordinates social media for the AOA Contact Lens and Cornea Section and has received the Dr. Rodger Kame Award for service to the section.

References


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