Contact Lens Clinical Pearls

POCKET GUIDE

FIRST in Education

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VERTEX CONVERSION CHART		
minus		plus
-3.87	4.00	+4.25
-4.00	4.25	+4.50
-4.25	4.50	+4.75
-4.50	4.75	+5.00
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-14.50	17.50	+22.25
-14.75	18.00	+23.00
-15.12	18.50	+23.75
-15.50	19.00	+24.75

CONTENTS

Special Thanks

To the GP Lens Advisory Board and especially
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SPHERICAL GP LENSES

Before the Fitting

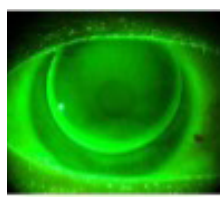
- Present initial adaptation with terms such as “lens awareness” and “lid sensation.”
- Consider using a topical anesthetic prior to initial lens application.

Empirical versus Diagnostic Fitting

- Diagnostic fitting has the benefit of more quickly obtaining an optimum fit and power through the application of diagnostic lenses at the initial fitting.
- Empirical fitting has the benefit of often having the first experience with GP lenses be a very positive one visually.

Fitting Pearls

- Use a cobalt blue filter in combination with a yellow (Wratten) filter for optimum evaluation of the fluorescein pattern.
- Strive for an alignment fit. This is often achieved with a base curve radius (BCR) equal to the flatter K reading (termed “on K”) or slightly flatter than K due to the asphericity of the cornea.
- Lid attachment is preferable to reduce presence of peripheral desiccation (3-9 staining).

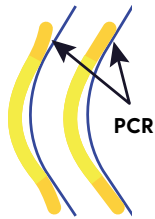


Alignment Fit

- Increasing the optical zone diameter (OZD) increases sagittal depth and effectively tightens the fit. Decreasing the OZD decreases sagittal depth and effectively loosens the fit.

OZD

- Flattening the peripheral curve radius (PCR) and/or the secondary curve(s) and/or increasing the curve width(s) of these curves will increase edge clearance.
- Steepening the PCR and/or the secondary curve(s) and/or reducing the curve width(s) will decrease edge clearance.



- When you make a design change, make it a significant one.
  - » Change the base curve by ≥0.50D; OAD/OZD ≥ 0.3mm; center thickness ≥0.03mm; peripheral curve radius/ width ≥1.0/0.2mm.
- Order a plus lenticular bowl to reduce edge thickness on all high minus (≥ 5.00D) and a minus lenticular bowl on all plus and low minus (≤ 1.50D) lenses to increase edge thickness.
  - » The use of a lenticular bowl, when indicated, in combination with an ultrathin center thickness, will reduce the risk of inferior decentration.
- To predict the lens power, take the spherical refractive value at the corneal plane. If selecting a BCR flatter than K, add the corresponding amount of plus power. If fitting steeper, add minus power (SAM/FAP or steep add minus, flat add plus). Ignore the cylinder power and the steeper K value.
  - » **Example:**
    Rx -4.50 -0.75 x 180; K's 43.00 @ 180/ 43.75 @ 090
    BCR 42.50D (0.50D flatter than K)
    The predicted power is -4.25D (-4.25D at the corneal plane) + 0.50D (FAP) = -3.75D
- To control possible lens flexure with fluctuating vision, consider adding 0.03mm to lens thickness to provide better clarity.

Resources

Resources on fitting and problem-solving GP lenses are available at **www.gpli.info.**

SOFT TORIC LENSES

Before the Fitting

- Patients with as low as 0.75D refractive cylinder are often good candidates.
- If a patient has ≥ 0.75D cylinder and is wearing a spherical lens, provide them with a toric lens to compare the quality of vision.

The Fitting Process

- Select diagnostic lenses as close to the refractive power at the corneal plane as possible.
  - » **Example:**
    A patient with a refraction of: -4.75 -1.50 x 180 should be fit with a diagnostic lens of -4.50 -1.25 x 180 (the powers at the corneal plane). If the exact cylinder power is not available, select the lower cylinder power lens. For instance, if the patient has -1.50 x 180 cylinder power at the corneal plane and the soft toric lens cylinder is available in either -1.25 or -1.75 x 180, select the -1.25 x 180 lens.
- Prioritize axis > cylinder power > sphere power when selecting an initial diagnostic lens.
- Allow the lens to settle for a minimum of 10 minutes prior to evaluation.
- To determine the amount of lens rotation, use a degree scale on the biomicroscope to line up an optic section with the axis mark on the lens. With this method, an exact amount of rotation can be read directly off the degree scale. If this scale is not available, the clock approach can be used to estimate the amount of rotation. With this method, each hour on a clock is equivalent to 30˚. In addition, apps such as “axis assistant” can be downloaded to a mobile device.

- To determine the axis of the final lens, use the "left add, right subtract" (LARS) technique. If the patient has a refraction of -2.00 -1.25 x 180, and a lens with these identical parameters is applied to the patient's right eye and rotates 10° to the observer/practitioner's right (nasally), a lens with an axis of 170° should be fitted. If it rotates 10° to the observer's left (temporally), a lens with a 10° axis should be fitted.
- Subtract the amount of rotation from the glasses prescription, not the diagnostic lens. Also, the final lens ordered should fit in the same skewed position as the diagnostic lens.
- Tolerance for rotation is reduced as the cylinder power increases. Always compensate the rotation when ordering the final lens.

Rx axis at 180° and no rotation Order Lens Axis at 180°

Rx axis at 180° and 10° right rotation Order Lens at Axis 170°

Rx axis at 180° and 10° left rotation Order Lens at Axis 010°

Poor Visual Response

- If reduced vision is present with a spherical over-refraction (OR), a sphero-cylindrical OR should be performed. To determine the recommended cylinder power and axis based upon the OR, use one of many available online cross cylinder calculators. This is effective only if the lens is rotationally stable.
- If the patient experiences a persistent problem with vision due to lens rotation or other reasons, a GP lens should be considered.

GP BACK SURFACE AND BITORIC LENSES

Before the Fitting

- Good candidates are individuals with > 2.00D of corneal cylinder who do not achieve good centration and/or have a poorly aligned fit, or are dissatisfied with their vision from soft toric lenses, or have critical vision needs.

Decision-Making Process

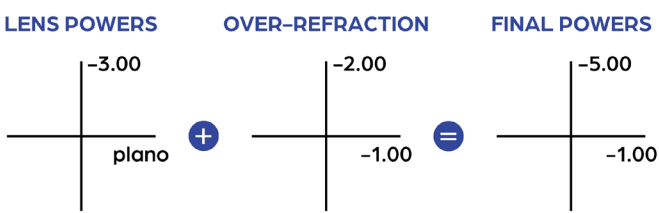
- A back surface toric lens induces a cylinder equal to almost half of the back surface toricity with the same axis (the exact amount depends upon the refractive index of material).
- When the cylinder is corrected on the front surface, it results in a bitoric lens.
- A back toric design (spherical front surface) is recommended when the residual astigmatism is approximately one half of the back surface toricity and has an axis equal to the flat K reading. This should also be considered when the patient's refractive cylinder is approximately 1½ times the corneal cylinder.

Empirical Versus Diagnostic Fitting

- Although some diagnostic fitting sets – often with 3D of toricity – are still available, advances in manufacturing technology make empirical fitting a very desirable and popular option. This has the benefit of making the initial patient experience with GP toric lenses a positive one visually.
- The GPLI has several calculators on their website (**www.gpli.info**) to make toric lens design a very simple process. This includes the GPLI Toric and Spherical Lens Calculator, the Mandell-Moore Guide, and the Newman GP Toric Guide.

Fitting Pearls

- Bitoric lens power determination only differs from spherical lenses in that two tear lens power calculations are needed, not one.
- The flatter base curve is typically selected equal to - 0.25D flatter - than flat K. The steeper base curve radius is typically 0.75D flatter than steep K. This creates 0.50 - 0.75D of toricity, which would simulate the ideal cornea to fit a spherical lens. The result should be an approximate alignment fitting relationship.
- If a diagnostic lens is selected, a spherical over-refraction should be performed and the resulting power should be added to the power in each meridian. If the diagnostic lens powers are plano in the 180˚ meridian and 3.00D in the 90˚ meridian and the over-refraction is -1.00D, the final powers are -1.00D and -4.00D. This lens can rotate on the eye without affecting vision (spherical power effect).
- If the patient has residual astigmatism, it is likely that a sphero-cylindrical over-refraction will result in optimum acuity. If so, the over-refraction in one meridian should be added to the lens power in that meridian. In the above example, if the over-refraction is -1.00 – 1.00 x 180, -1.00D would be added to plano, and -2.00D (in the 90˚ meridian) would be added to -3.00D resulting in powers of -1.00/-5.00D. (see optical cross below)



- Toric GP lenses are not often indicated with irregular cornea patients as the refractive axis differs from the corneal axis and bitoric designs have base curve radii and corresponding powers 90˚ apart.

MULTIFOCAL LENSES

Decision-Making Process

- You may explain all options to every presbyope or emerging presbyope including single vision lenses/reading glasses, monovision, and multifocal lenses, but always make a firm, confident recommendation based on the following:
    - » The benefits of multifocals versus monovision include improved quality of vision due to increased binocularity and stereopsis (depth perception).
    - » Many comparison studies between soft and/or GP multifocals versus monovision have resulted in approximately 75% of the patients preferring multifocals.
    - » Monovision is indicated when the patient either has miotic pupils (insufficient power effect may be obtained from the paracentral aspheric region), or pupils larger than 6mm (which may cause visual disturbance from the mid-periphery of the lens), or when the patient is unhappy with the vision of a multifocal lens.
- Determine what the patient's goals are for these lenses.
    - » Have the patient rank the importance of distance, intermediate, and near vision. By concentrating on the two most important, the patient will likely be satisfied with their vision in multifocal lenses. It is important to explain that modality will require neural adaptation. Neural adaptation can take several weeks.
- Patients need to be given realistic expectations.
    - » Most contact lens multifocal designs utilize the simultaneous vision principle in which multiple corrections are overlapping in front of the eye. Educate the patient that their vision quality will look different when compared to spectacles.

» Neuroadaptation occurs for most patients. It may take 7-10 days to get the optimal outcome of a fit. Do not make modifications too early in the process.

» In addition, it may take one or more lens exchanges to achieve a successful fit and acceptable vision.

» Finally, patients should be told that they may still require spectacles. Some multifocal wearers appreciate a low minus over-correction when driving while others may desire some additional plus for reading fine print. Inform the patient that good light will also help improve near vision.

» Patience and motivation are required for success. We highly recommend you work with your local laboratory representative, particularly when just beginning with a new multifocal design.

The Fitting Process

- Important tests to perform include a detailed refraction, corneal shape assessment, pupil size measurement, tear film evaluation, and measuring lower lid position.
- When possible, it is important that the patient's first experience in multifocal lenses is with lenses in their prescription so order your first pair of GP multifocals empirically, or if fitting a soft multifocal, use lenses from a soft lens inventory.
- After lenses are applied, assess vision at distance and near under binocular conditions. Consider using a topical anesthetic drop at first dispense to maximize patient comfort and allow for best assessment of vision, as reflex tearing can affect accuracy of over-refraction and acuity measurements. If vision is reduced, over-refract bi-ocularly with hand-held diagnostic lenses or a flipper bar held over one eye at a time. As a general rule you will add minus to the dominant eye to improve distance vision and plus to the non-dominant eye to improve near vision. However, if additional minus does not improve the level of acuity and vision quality, consider decreasing the add zone size or encouraging

further adaptation rather than changing lens power. Even small (0.25D) changes can have a significant effect in overall vision. Sometimes you will want to change add power to improve vision. Follow the manufacturer's fitting guide.

- When assessing vision at near, have the room lights up and make sure the patient is reading commonly encountered text (magazine, cell phone, etc.) that is similar in font to their everyday material and consistent with what they desire to see at near.
- Once the lenses have been evaluated, have the patient walk around the office and perform normal visual tasks. Encourage binocular viewing. Discourage viewing monocularly (the "contact lens salute"). Explain "these lenses are designed to work together."
- If satisfactory vision and fitting relationship is achieved, schedule an appointment, at minimum, one week later to allow the patient to become adapted to the lenses.

Soft Multifocal Lenses

- Good candidates include individuals who do not have highly critical vision demands, have ≤ 0.75D refractive cylinder (unless using toric multifocals), and are satisfied spherical soft lens wearers. If they decide to be fit with soft multifocals, they should be informed about the GP multifocal option if vision becomes problematic.
- For the initial diagnostic lens, follow the manufacturer's fitting guide. Often it is recommended to select the power equal to the spherical equivalent of the manifest refraction vertexed to the corneal plane. For example, if the refraction at the spectacle plane is -4.50 -0.50 x 180, the initial diagnostic lens would be equal to -4.50D. Some soft lens multifocal manufacturers recommend you begin by increasing the distance power for each eye by +0.25 D.
- The final lens power should be the lens that emphasizes "least minus, most plus" if there is a range of lenses that provide acceptable distance vision.
- Allow the lenses to settle at least 10 minutes after application before evaluation.

- Be sure to consult the manufacturers' fitting guides and problem-solving recommendations for their unique lens design.
- It is a good practice to evaluate lens position (centration) with the topographer if available.

GP Multifocal Lenses

- This option is great for patients nearly all patients, but particularly those with astigmatism or with critical vision demands.

Aspheric lenses

- Aspheric lenses are a great option, particularly for those who perform a wide variety of tasks each day. Be cautious about prescribing aspheric lenses for individuals who have a large (≥ 6mm) pupil diameter. For uninterrupted vision at distance and near, segmented translating (bi) multifocal lenses are recommended. Aspheric lenses should result in good centration, and limited (1mm) movement with the blink.
- If the lens moves excessively, select a lens with a 0.50D steeper base curve radius. If continued movement is noted, consider repeating cornea measurements and/or increasing the lens overall diameter.

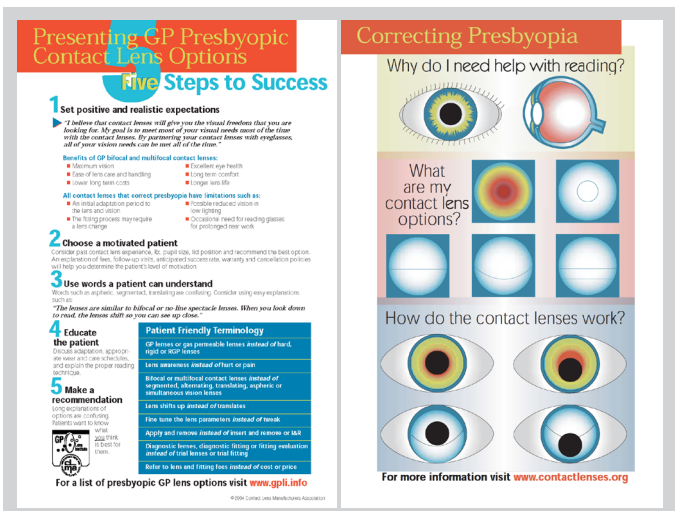
Segmented lenses

- Segmented, translating bifocal lenses typically have the seg line positioned at or slightly below the lower pupil margin. Many designs have an aspheric or segmented intermediate zone, which should be positioned right above the lower pupil margin.
- The lens should move minimally (1mm) with the blink.
- Great candidates for this design are any patient requiring crisp vision. Poor candidates for this design include anyone with a lower lid that rests below the lower corneal limbus.
- When viewing through the biomicroscope, have the patient look down and the lens should shift upward, or translate, as the edge comes in contact with the lower lid.

- If the lens does not translate (or only does so intermittently), adjust according to the lens manufacturer's troubleshooting recommendations.
- If the lens moves excessively, increase the prism ballast, steepen the BC or peripheral curves to reduce interaction with the eyelids.

Resources

For assistance with problem-solving GP bifocal and multifocal lens designs, the Contact Lens Manufacturers Association (CLMA) laboratory consultants are an invaluable resource. In addition, the GP Lens Institute has numerous resources, like the one pictured here, available at **www.gpli.info**.



ORTHOKERATOLOGY

Before the Fitting

- Good candidates include < 5.00D myopia, ≤ 1.50D WTR corneal cylinder or ≤ 0.50D ATR cylinder; < 6mm pupil diameter, and less than 0.75 D lenticular cylinder who are compliant and motivated.
- Important screening tests include refraction, slit lamp evaluation, pupil diameter evaluation, corneal topography and anterior segment optical coherence tomography (AS-OCT).
- Topography will rule out patients with irregular corneas as well as provide corneal eccentricity values and horizontal visible iris diameter.

The Fitting Process

- The "Jessen formula" can often be used to determine the base curve radius.
    - » It uses the FAP (flat add plus) tear lens factor to result in a final power of +0.50 to +0.75D, which will allow for regression during the day.
    - » If the patient has a refractive error of -3.00 -0.75 x 180 and keratometry values equal to 44.00 @ 180/ 44.75 @ 090, the base curve should equal 3.75D (3.00D + 0.75D) flatter than flat K, which is equal to 44.00D -3.75D or 40.25D.
    - » The initial diagnostic lens is selected in an effort to achieve a bull's eye fluorescein pattern (central bearing, paracentral pooling, midperipheral bearing, and slight peripheral clearance).
- Wait at least 10 to 15 minutes before evaluating the fit.
    - » Instill fluorescein, wait 1 minute more and evaluate fluorescein pattern.
    - » Good centration with minimal (≤1mm) lag with the blink is desired.

- The patient should be evaluated the morning after dispensing.
  - » Assess the lens-to-cornea fitting relationship.
  - » The lenses should be removed to assess corneal integrity. If coalesced corneal staining is present, the lens is too flat centrally. Improvement in unaided visual acuity should be present.
  - » Corneal topography should be performed and a bull's eye pattern (central flattening, paracentral steepening) should be present indicating that the treatment is centered on the eye and symmetrical.
  - » Remember that the lens position under the slit lamp may differ from the lens real behavior during sleep. Performing pre- and post-fit topographic map analysis is the best way to assess lens position on the eye. AS-OCT can be performed to assess epithelial thickness to monitor treatment position and provide supplemental information to topography on fitting characteristics.
  - » If the lens sits superior, resulting in a "smiley face" topography pattern, the lens is too flat/shallow. If the lens decenters laterally, inferiorly, or there is a "central island" topography pattern, the lens is too steep/deep.
  - » If the lens is centered, check the over-refraction. If the over-refraction is –0.50 D or more minus, then flatten the base curve by 0.1 mm for every –0.50 D; if over refraction is +0.50 D or more plus, then steepen the base curve by 0.1 mm for every +0.50 D unless the manufacturer recommends otherwise.
  - » If no obvious topography pattern is present, the patient should wear the lenses for 2 more days and be re-evaluated.
- On average, it takes approximately 10 days to reach the treatment goal although it will likely be less for lower myopic and higher for more moderate myopic powers.

- Provide the patient daily disposable lenses of approximately half of the patient's myopic refractive error [to keep it simple for patient?] to wear during the treatment period and re-evaluate at one week.
- Patients can self-monitor retainer wear. Whenever the distance vision becomes blurred, they can wear the lenses overnight. This may range from every night for someone originally manifesting moderate myopia to as low as 1 – 2 times a week for the low myope.
- Applying a highly viscous artificial tear prior to inserting the lens has been found to optimize centration and lessen corneal staining.
- Lens removal should occur a few minutes after awakening.
- Rewetting drops should be applied before removal and the lower lid margin can be used to gently nudge the lower lens edge to break suction if present.
- It is important to get certified – via the manufacturer of a specific orthokeratology lens design – prior to fitting that specific lens.

KERATOCONUS

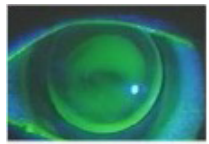
Before the Fitting

- Hallmark biomicroscopic signs of keratoconus are Fleischer's ring, Vogt's striae, prominence of corneal nerves, and possibly stromal scarring. Apical steepening/thinning can be difficult to assess with slit lamp examination alone.
- With corneal topography in keratoconus, the steepest area of the corneal topography is typically >48.00D. Also, if the eccentricity value is greater than or equal to 0.8, it is suspicious for keratoconus. Additionally, other indications for keratoconus include asymmetry of superior vs. inferior curvature of over 1.25D and non-orthogonal astigmatism with a skewed axis of >20 degrees. Scheimpflug-based corneal tomography has the ability to measure shape of both the anterior and posterior cornea as well as measurement of global corneal thickness. Abnormalities of the posterior corneal shape (elevation) always exceed those of the anterior corneal shape (elevation). Abnormalities of corneal thickness distribution (rate of change of corneal thickness from the thin point out to the periphery) is a key finding in keratoconus whereas abnormalities of central corneal thickness are not specific nor sensitive for the detection of keratoconus.
- In a moderate-to-advanced keratoconic patient, in the absence of a corneal topographer, the use of a +1.25D diagnostic lens over the patient's side of the keratometer will extend the keratometer's range by about 8.00D. A +2.25D diagnostic lens will extend the range by approximately 14.00D. This can help you "ballpark" the patient's K values.

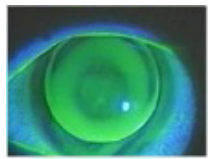
The Fitting Process

- If the apex of the cone is relatively small and centrally located, a traditional small diameter keratoconic lens may be used.
- If a large oval or globus cone is present or the apex is decentered inferiorly: intralimbal, scleral, piggyback, or vaulting hybrid designs have all been successful.

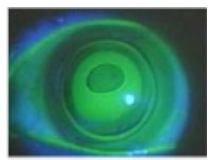
- With most designs, minimal apical clearance or mild touch is desired. This "three-point touch" or bull's eye fluorescein pattern is most likely achieved on a relatively well-centered apex.
  - » Gross apical bearing can result in corneal staining and possibly accelerate scarring.
  - » Excessive apical clearance can result in peripheral seal off.
  - » The presence of excessive inferior edge clearance can be remediated with designs that allow the inferior edge to tuck in (flat-steep, ACT, quadrant specific).



Three Point Touch



Excessive Apical Bearing



Excessive Apical Clearance

- A piggyback design combination should be considered if a GP lens alone results in either poor centration, less than optimum comfort, or if scarring is present.
  - » A very low power (+0.50D) silicone hydrogel soft lens can be placed under the best fitted GP. Plus lenses often are preferred to minus lenses (see below). Due to the lens combination it is important that a hyper Dk (>100) GP material be used.
  - » If the patient has a low corneal apex resulting in the GP lens positioning low on the soft lens, the use of a moderate plus power (+6.00D) soft lens may help the GP lens center due to the thicker center of the soft lens. This should result in little to no change in the GP power as a soft lens contributes only about 20% of its power when used in a piggyback system.

Resources

For assistance with keratoconic patients, communicate with your CLMA laboratory consultant. For resources, contact the National Keratoconus Foundation (**nkcf.org**), the International Keratoconus Academy (**keratoconusacademy.com**), and the GP Lens Institute (**gpli.info**).

SCLERAL LENS FITTING AND HANDLING

Definition and Applications

- Scleral lenses are large diameter gas permeable lenses that completely vault the cornea and limbus and align with the bulbar conjunctiva overlying the sclera. They are no longer classified by diameter size, but rather where they come to rest on the ocular surface. Corneo-scleral lenses are lenses that rest partly on the cornea (either on the apex or on the periphery of the cornea) and partly on the conjunctiva overlying the sclera.
- Scleral lenses have a range of indications including irregular corneas, severe dry eye or ocular surface disease, and normal corneas. Corneo-scleral lenses have been typically recommended for healthy cornea patients and scleral lenses have been successful for patients with corneal irregularities (e.g., keratoconus, pellucid marginal degeneration, corneal transplants) and ocular surface disease and scarred, severely pathological corneas.

Lens Handling and Patient Education

Lens Application (non-fenestrated)

- For initial fitting evaluation, the lens should be completely filled with isotonic, non-preserved saline or approved preservative-free filling solutions. Fluorescein from a strip should be added to the filled bowl. If seated, cover the patient's lap with paper towels before application as some of the solution and fluorescein will overflow and may stain clothing. The lens can be supported on a large DMV scleral suction cup/ DMV applicator or equivalent. Alternatively, a tripod made up of the thumb, middle, and index finger, can be used.

- The face should be parallel to the ground and the lids must be retracted and well-controlled. The patient should look straight down toward the ground. The patient may assist in retracting either a lower or upper lid and the lens is applied centrally covering the cornea. The lids should be released prior to lowering the supporting DMV applicator. If the suction cup is sealed, it should be squeezed upon application to release the lens onto the eye; and then may be pulled away. If it is not sealed, then the applicator may be gently pulled away after the lens is applied to the eye.
- If a large bubble is observed after application, either the lens was not applied in one continuous motion, it was tilted or the lens well was not completely filled with solution. Remove the lens and reapply.
- A handheld blue light can be used to easily determine if an insertion bubble is present prior to evaluating the patient in the slit lamp.

Lens Removal

- As the lens will likely be semi-sealed to the eye, always loosen the lens prior to removal. An appropriate rewetting drop should be applied and the inferior periphery of the lens should be gently pushed in a repeated motion for several seconds.
- With the superior lid well controlled, the inferior lid can be used to lift the lower portion of the lens away from the eye.
- Alternatively, a medium DMV suction cup/plunger can be used. If so, it should be applied to the lens periphery and then pulled in a direction that is down and out with the removal force directed perpendicular to the lens surface, not along the visual axis. The suction cup/plunger should never be applied in the center of the lens, as this will provide increased suction and discomfort upon lens removal. The only exception to removing the lens from the center is if it is fenestrated.

- If the suction force is not allowing for an easy release of the lens, lightly pressing a finger against the inferior eyelid to indent the sclera just below the lens edge can help release suction while simultaneously using the DMV suction cup to remove the lens.

Fitting Principles

- It is important for the lens to completely vault the cornea while aligning the lens to the bulbar conjunctiva.

Choose the Overall Diameter

- In general, larger lenses can hold more fluid in the corneal chamber and tend to be more forgiving for the fitter, allowing for more clearance over the cornea.
- Smaller lenses must more closely vault the cornea and demand a more precise central fit.
- For highly irregular corneas, larger lens diameters may be more appropriate in order to provide enough alignment on the conjunctiva to support an increased sagittal depth of the vaulted lens.
- For ocular surface disease, choose a larger diameter to provide maximum ocular surface coverage and protection.
- Lens diameter may also be dictated by conjunctival abnormalities, aperture size, and patient dexterity.
- In addition, some manufacturers provide guidelines for selecting an overall diameter based on visible iris diameter.

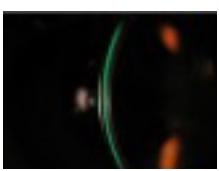
Choose an Initial Diagnostic Lens

- Follow manufacturer's fitting guide.
- In some cases, a simple approach is to stand beside the patient, and observe the corneal profile. If very steep, choose a deeper sagittal depth lens. If the profile is flat, select a shallower sagittal depth lens.
- These lenses are fit on the basis of sagittal height, so this method can be very effective when used properly.

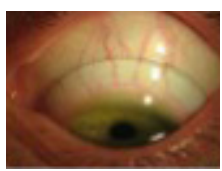
- Some manufacturers supply prolate and oblate lens profiles and provide guidelines for selection. Typically, prolate designs are indicated for keratoconus and oblate designs can be used with post-penetrating keratoplasty or post-refractive surgical corneas. Corneal topography or grossly observing the peripheral profile by standing next to the patient may also assist in lens profile determination
- Algorithms incorporated in corneoscleral profilometers help in the identification of the diagnostic lens to be applied on the eye, based on the patient's scleral shape.

Examine the Corneal Fit

- With white light and an optic section at high illumination and medium magnification, set the slit lamp housing off axis and examine the central corneal clearance.
- You will see several layers in cross section. The outermost band (dark black) is the lens. The dark area is straddled by two hairline reflections that arise from the front and back surface of the lens. Compare this black layer to the tear lens (green).



Good Fit - Optic Section



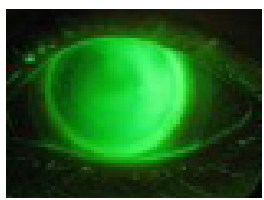
Good Fit - Down Gaze

- For example, if the diagnostic lens is known to have a thickness of 300 microns and the tear lens appears to be half that thickness, then the lens vaults the cornea by approximately 100 to 150 microns. Ideal clearance may vary by design and is often less if the lens is fenestrated. Initial lens clearance should provide enough room for settling over time. According to the evidenced-based CLEAR report on scleral lenses, the recommended target central vault ranges between 300-500 um immediately after application and 100-300 um after lens settling.[1]

- Apply diagnostic lenses until an acceptable central clearance has been achieved that is recommended by the manufacturer and allows for settling to occur.
- Note that after applying any type of scleral lens, it will settle into the conjunctiva over a 30-to-40-minute period. As stated before, settling will decrease the corneal vault and possibly lead to touch in an area that was vaulted upon initial application of the lens.
- A diagnostic lens that shows gross, excessive vaulting of the central cornea initially should be removed and replaced with a shallower sagittal depth.
- However, if the corneal vault is only mildly excessive upon initial application of the diagnostic lens, it is best to allow the lens to settle since it may yield an ideal corneal vault after 30 to 40 minutes.

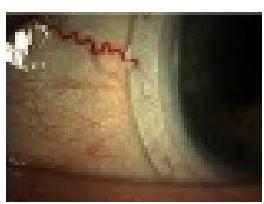
Corneal versus Peripheral Fitting Relationship

- Overall, the fit of a scleral lens can be divided into two parts; the central fit and the peripheral fit (over the conjunctiva).
- Examine the entire corneal clearance under diffuse cobalt blue, a yellow Wratten filter, and high illumination. Ensure there is good clearance over the cornea and also mild limbal clearance.



Good Fit

- When fitting an irregular cornea, it is possible to observe touch or bearing in the mid-peripheral or peripheral cornea once acceptable central clearance has been obtained.
- In these cases, additional clearance must be created in the problem area without grossly increasing the central clearance.



Scleral Compression

- An oblate or reverse geometry design can be employed to vault over the areas of touch/bearing, but depending on the design, increases in the central corneal clearance and compensatory changes may be required. Discussion with manufacturer's design consultants can be very helpful.
- The peripheral portion of the lens should align with the bulbar conjunctiva.
- Compression, or general indentation of the conjunctiva, whether at the edge or mid-periphery of the lens, may result in seal off, suction and indentation. Modification of the lens design is warranted to loosen the areas resulting in seal-off and/or suction.
- When blanching occurs, flatten the peripheral curve associated with the area of blanching.
- Excessive movement and/or bubble formation after lens application may indicate the peripheral curve(s) are too loose; therefore, tighten the peripheral curve(s).
- Impingement of the conjunctiva may occur, resulting in conjunctival arcuate staining or in extreme cases conjunctival hypertrophy. If impingement occurs, loosen the periphery by flattening or raising the edge.
- The sclera may not be spherical. Careful observation of the landing zone in each meridian may help determine if toric or quadrant-specific peripheral curves of the landing zone may be required.
- Conjunctival abnormalities or elevations may require customization of the peripheral curve system. Options may include vaulting, notching, or freeform and/or molded lenses.

Over-topography

- It is beneficial to perform computerized topography over the contact lens in situ after it has settled for a few minutes. This can reveal any lens flexure. Flexure can be addressed by careful evaluation of the haptic alignment. If toric peripheral curves are not indicated, increasing center thickness may reduce flexure.

Check for Tear Exchange

- Before a scleral lens is dispensed to ensure a lens does not seal off or suction, proper tear exchange should be demonstrated. Apply the lens without fluorescein in the filling media. After the lens has been properly applied, instill a generous amount of fluorescein dye over the top of the lens with a dye strip. Periodically examine the tear lens and check for dye that has made its way behind the lens into the tear chamber. After several minutes, there may be at least a small amount of dye in the tear lens.
- Tear exchange does not need to be rapid, but it is useful for a proper fit. If in the test for tear exchange there is no fluorescein seen in the corneal chamber after waiting for several minutes, flatten or loosen the peripheral fit or increasing the overall diameter may help.

1. Barnett M, Courey C, Fadel D, et al. CLEAR – Scleral lenses. Cont Lens Anterior Eye 2021 Apr; 44(2):270-288.

DIOPTER TO RADIUS (MM) CONVERSION CHART			
Diopter	Radius	Diopter	Radius
34.00D	9.92mm	44.00D	7.67mm
34.25D	9.85mm	44.25D	7.63mm
34.50D	9.78mm	44.50D	7.58mm
34.75D	9.71mm	44.75D	7.54mm
35.00D	9.64mm	45.00D	7.50mm
35.25D	9.57mm	45.25D	7.46mm
35.50D	9.50mm	45.50D	7.42mm
35.75D	9.44mm	45.75D	7.38mm
36.00D	9.37mm	46.00D	7.34mm
36.25D	9.31mm	46.25D	7.30mm
36.50D	9.24mm	46.50D	7.26mm
36.75D	9.18mm	46.75D	7.22mm
37.00D	9.12mm	47.00D	7.18mm
37.25D	9.06mm	47.25D	7.14mm
37.50D	9.00mm	47.50D	7.11mm
37.75D	8.94mm	47.75D	7.07mm
38.00D	8.88mm	48.00D	7.03mm
38.25D	8.82mm	48.25D	6.99mm
38.50D	8.76mm	48.50D	6.96mm
38.75D	8.70mm	48.75D	6.92mm
39.00D	8.65mm	49.00D	6.89mm
39.25D	8.60mm	49.25D	6.85mm
39.50D	8.54mm	49.50D	6.82mm
39.75D	8.49mm	49.75D	6.78mm
40.00D	8.44mm	50.00D	6.75mm
40.25D	8.39mm	50.25D	6.72mm
40.50D	8.33mm	50.50D	6.68mm
40.75D	8.28mm	50.75D	6.65mm
41.00D	8.23mm	51.00D	6.62mm
41.25D	8.18mm	51.25D	6.58mm
41.50D	8.13mm	51.50D	6.55mm
41.75D	8.08mm	51.75D	6.52mm
42.00D	8.04mm	52.00D	6.49mm
42.25D	7.99mm	52.25D	6.46mm
42.50D	7.94mm	52.50D	6.43mm
42.75D	7.89mm	52.75D	6.40mm
43.00D	7.85mm	53.00D	6.37mm
43.25D	7.80mm	53.25D	6.34mm
43.50D	7.76mm	53.50D	6.31mm
43.75D	7.71mm	53.75D	6.28mm