GENERAL FITTING PRINCIPLES OF FITTING SCLS

1. General principles of fitting
   A. The holding forces of a lens against the eye are governed by the laws of adhesion
      1. The more alike 2 surfaces in contact are, the greater will they hold on to each other
      2. The larger the two like surfaces are in surface area, the greater will they tend to adhere to each other
   B. The forces that will tend to dislodge the lens from the central cornea are:
      1. The forces of the moving upper lid
      2. The vertical forces of gravity (not much influence in SCLs)
   C. The greater the lens mass, the more will it tend to move inferiorly

2. An ideal soft lens fit attempts to achieve a "3 point touch"
   A. There is "broad central draping" of the lens over the corneal optical cap and onto the paraprophernal cornea.
   B. "Vaulting" over the limbal junction area to provide for a lacrimal peripheral pool between the lens and the peripheral cornea, limbal and marginal scleral area that can respond to upper lid blink pressure creating an area of positive and negative pressure as the lid passes down and then up so as to provide a lacrimal pump for the interchange of oxygenated tears and sloughing off of tear debris
   C. Peripheral contact at the scleral zone where the lens rests by producing a peripheral lens bevel contour approximating the curvature of the flatter sclera

3. An acceptable fit must meet the following criteria
   A. maintenance of integrity of the ocular tissues
   B. proper movement
   C. good visual acuity
   D. proper centration
   E. patient comfort

4. Always fit a soft lens as large and flat as is necessary to achieve the above criteria

5. Lens diameter and the base curve of a lens are inversely related.
   A. The larger the diameter, the tighter the fit
   B. The larger the radius, the looser the fit
   C. Therefore to maintain the same fitting relationship when you increase the diameter, you must fit slightly flatter to neutralize the tightening that would otherwise occur

   1. 12.0 to 13.0 mm diameter lenses are generally fit 2.00 to 3.00 D flatter that the flattest K. (1.00 D - about 0.2mm)
   2. 13.0 to 15.0 mm diameter lenses are generally fit 3.00 to 5.00 D flatter than K

6. Lens thickness influences holding power of lens against the eye
   A. A thinner lens tends to cling to or conform more closely to the contour of the eye by molding itself against the eye
   1. This will cause a tighter fit relationship and require that thinner lenses be fit somewhat flatter than thicker more rigid (thicker) lenses to compensate for this tightening effect.

7. Increased water content influences holding power of lens against the eye
   A. Increased water content tends to increase the flexibility of the lens, causing it to cling more to the eye, producing a tighter lens relationship which must be neutralized by a somewhat flatter lens design.

8. Design of posterior curve of lenses influences hold power of lens against the eye
   A. A lathe cut lens with a spherical posterior curve will have greater posterior peripheral holding power as the peripheral cornea normally tends to flatten
B. A spin cast lens has an elliptical posterior contour which tends to flatten peripherally causing it to be aspheric with different eccentricity values for different lenses dictated by the influence of centrifugal forces as the lens is spun at different speed to create variable central posterior curves

1. This variable peripheral eccentricity makes the spin cast lens more likely to decenter and more difficult to maintain optimum centration as power change are made to optimize visual acuity, since, in any one lens series, power changes are made by altering posterior *inside) curves with resultant changes in peripheral lens eccentricity, and thus holding relationships to the eye

9. Posterior peripheral curve width
A. Based on the concept of 3 point touch, the wider the peripheral curve width contouring the sclera, the greater the holding power of the lens

10. Anterior surface construction
A. A lenticular anterior construction causes lesser lid/lens edge interaction and permits greater lens stability
B. A lenticular design also reduces lens mass adding to greater lens adherence by reducing gravitation forces

11. Factors that tighten a lens are
A. Increased diameter
B. Shortening of radius (steeper curve)
C. Thinner lens material
D. Wider peripheral curve width
E. Higher water content
F. Spherical vs. aspherical posterior curves
G. Reduced lens mass and edge contour

12. Factors that loosen a lens are
A. Reduced diameter
B. Lengthening of radius (flatter curve)
C. Thicker, more rigid material
D. Reduction of peripheral inside curve width
E. Aspheric vs. spherical posterior curves
F. Decreased water content (but not through evaporation of fluid on the eye. Evaporation makes a lens fit tighter
G. Increased lens mass and thicker edge contour

13. Proper movement
A. All lenses must display some movement to facilitate tear exchange necessary to maintain proper corneal physiology
B. The more oxygen permeable the material, the less movement necessary
C. Tearing and lens dehydration will influence movement and allowance should be made for these variables in evaluating movement
D. A lens that looks too good too soon, may end up as a tight lens when tearing subsides and the lens has suffered some dehydration
E. Movement should be checked while eye moves in all four cardinal directions as well as in the primary position
F. Optimum movement - primary position

1. Observe lens edge as patient looks directly ahead and blinks
2. Blink should be a natural reflex blink performed after reflex tear flow has subsided and the lens has reached fluid equilibration
3. Ideal vertical post blink movement should be 0.5 to 1.0 mm up with a rapid return of the lens to a centered, resting position when the patent looks directly ahead
4. A loose lens will move up with its lower edge usually crossing the inferior limbus,
and ride high after the blink or tend to decenter temporally

5. Movement is influenced by
   A. Edge thickness and design
   B. Form and tightness of the lid
   C. Viscosity of tears and amount of "salt" in the tears
   D. Corneoscleral limbus contour angle

6. A tight lens will show little post blink vertical movement and may tend to ride low after the blink
   G. Lens sag on upward gaze
1. Direct client to look upward causing lens to drift gently downward toward the lower cul-de-sac
2. Lens movement evaluation should be made after a normal blink
3. A loose lens will sag downward 2.0mm or more
4. A well fitted lens will move downward approximately 1.5 to 2.0 mm and come to a resting position
5. An excessively tight lens will not exhibit any post blink movement
6. A test can be performed with and without lower lid retraction
7. Locating and referring lens movement to an anatomic landmark is helpful
14. Proper centration
   A. A soft lens ideally should cover the entire cornea limbus to limbus and overlap onto the sclera for about 1 mm.
   B. An ideal lens diameter should be equal to the horizontal visible iris diameter (HVID) plus 2.0mm to produce a one mm circumcorneal overlap onto the sclera
   C. Exposed areas of the cornea usually lead to corneal desiccation, irritation, limbal injection and staining
   D. Particular attention should be given to the area of the cornea under the upper lid
1. If the superior lens edge rests below the superior limbus, there will result discomfort from upper lid pressure as well as excessive lens movement induced by the upper lid.
2. Centration can be corrected by
   A. Altering lens diameter to achieve complete covering of entire cornea
   B. After altering the diameter, base curve radius can be modified to change holding effectiveness (shortening)
   C. Decreasing lens thickness
   D. Increasing lens hydration
   E. Decreasing lens mass
   F. Changing from spin cast go lather cut posterior surface
15. Proper vision
   A. Visual acuity should be stable and not fluctuate with blink action and should meet the patient's occupational and recreation needs
   B. Factors causing fluctuating vision are:
1. Flexing phenomenon
   A. Occurs when a lens fails to conform to the central corneal contour and effectively becomes a steep fit due to central vaulting of the corneal optical cap
   B. Vision clears momentarily after blink as the lid presses the lens against the cornea temporarily eliminating the cornea vault
   C. The keratometer mires observed with the lens on the cornea would appear to fluctuate in quality and clarity between blinks, but become temporarily sharp and clear immediately after the blink as the lid presses the lens against the cornea, eliminating the corneal vault
D. Retinoscopy reveals similar distortion of reflexes a loose lens blurring the reflex immediately after the blink while a tight lens will produce a clear reflex immediately after the blink

2. Excessive movement
   A. Can cause visual fluctuations as optical zone of the lens moves away from the pupillary line of sight
   B. Can cause visual distortion due to optical effects of lens flexing and wrinkling

3. Dehydration
   A. Causes increase in index of refraction of the lens material and steepening of curvature
   B. Causes greater mechanical movement by increasing friction with upper lid
   C. Make lens more prone to deposit build up of lipo-protein deposits on the lens surface which may cause optical diffraction and dispersion

4. Poor fit due to power change
   A. Use diagnostic lenses close to refractive need of patient (within 3.00 D) to minimize chances of ordered lens adversely affecting fit compared to diagnostic lens
   B. Spin cast lenses will provide change if fit with change in power influencing movement and centration

5. Poor fit due to poor lens/cornea alignment causing physiological corneal distress in the cornea of edema

6. Head turning test
   A. Determines if reduces vision is due to:
      1. Improper lens centration
      2. Poor lens optics
      3. Residual astigmatism
   B. After best over refraction has been completed to maximize acuity, patient is instructed to look monocularly at the smallest readable Snellen line while in the primary gaze position
   C. While maintaining fixation on the chart, the patients head is slowly rotated to about 45 degrees right and the left, and any change in acuity is immediately noted
      1. With improper centration - the patient will report improved acuity with the head turned (generally nasally)
      2. With poor optics - different positions will affect the acuity due to differences in optical distortion in various parts of the lens central zone
      3. With unresolved astigmatism, - vision will sometimes also change due to meridional or oblique astigmatic effects
   D. Sequence of corrective measures
      1. Refit for better centration
      2. Verify lens optics and optic cap or lenticular zone concentricity
      3. Recheck sphero-cylindrical over refraction and have patient look at an astigmatic clock dial through contact lenses with sphero-cylindrical over refraction to determine if all line appear equally as black
      4. Consider toric lens design if significant uncorrected cylindrical error still exists

16. Maintain integrity of ocular tissues
   A. A tight lens relationship will interfere with corneal physiology by oxygen deprivation causes edema and resultant corneal thickening
      1. Edema will alter acuity
      2. Thickening will affect curvature and therefore fit relationships
   B. A loose lens can cause disturbance by excessive movement causing corneal irritation, greater lid awareness, and corneal exposure and desiccation due to lens
decentration
C. Slit lamp evaluation of lens edge for fit
1. A flat lens will decenter upward and will show a flaring away from the lens periphery from the underlying conjunctiva with possible edge buckling or bubble formation at the inferior edge due to lens stand off
2. A tight lens edge will often impinge on the perilimbal bulbar conjunctiva and create a ring seal and seriously impair tear circulation to the cornea as well as the underlying conjunctiva, creating mechanical trauma
3. Vessel blanching due to lens compression
4. Scleral/conjunctival indentation
5. Conjunctival drag where the transparent loose conjunctiva is move by the lens edge of the tight lens following the blink
6. The subconjunctival vessels lying on the scleral surface may also be dragged up or down with tight lens edge movement
D. An optimal fit lens will produce no conjunctival tissue or vessel movement as seen under the lit lamp. The lens edge should glide smoothly over the perilimbal scleral region without tissue drag
E. Spring back test for base curve evaluation
1. Patients gaze is directed slightly nasal
2. The lids are gently separated with the thumb and index finger at the lash margin
3. With the use of the inverted edge of a clean rubber suction cup, or the end of a ribber tipper lens forceps, the lens is slid off the cornea temporarily so approximately half of the lens remains on the cornea and half is lateral to the limbus
4. As the lens is released (lids still being hold open) the lens will demonstrate a characteristic return as it attempts to slide back to its centered position on the cornea
A. A steep lens will resist being moved off the cornea and will momentarily tend to stay decentered after being moved half off the cornea. When nudged back nasally, it will return back vary rapidly (spring back) to the centered corneal position
B. A flat lens will be very easily moved off the cornea but will return slowly and sluggishly back to its central position when released, or remain off center
C. A well fitted lens will decenter with minimal resistance and will spring back to the centered position of the cornea rapidly and smoothly and released
5. Bubble test for base curve evaluation
A. Hold lids open with fingertips against orbital ridges as contact lens is placed astride the superior limbus while patient fixates downward
B. Half the lens is on the bulbar conjunctiva and half is on the cornea
C. The patient is directed to look forward and a distinct bubble is seen occupying the space between the center of the lens and the superior portion of the cornea and superior limbal zone
D. As the lens migrates down because of its own weight and the forces of adhesion between the two wet surfaces......
1. On a well fitted lens the bubble will rapidly disappear
2. On a steep lens the bubble will disappear slowly or remain, diminished in size, requiring several blinks to squeeze out the bubble
3. A flat lens will not show the bubble at all
17. Inventory vs diagnostic fitting
A. Soft lenses can be fit:
1. From an inventory of lenses on the premises by selecting the proper lens that gives the best fit and acuity
2. From a diagnostic trial set of standard diameters and base curves, combined with
over-refraction. The correct size and radius can then be interpolated by observing
the behavior of the diagnostic trial lens and ordering the fitting lens based on
anticipated modification from the trial lens
3. From the measurements of "K", refractive power and HVID and fissure size, and
referring to tables supplied by the manufacturer. (poorest method usually requiring
numerous refits to achieve successful fit.)
B. The only indispensable instrument for the fitting of a soft lens is another soft
lens, therefore the inventory method is the most favored approach, with the
diagnostic method running a poor second. (Diagnostic fitting is best for rigid
lenses.)
C. Fitting from inventory requires a coordinated method of inventory control as
lenses are dispensed
D. Inventory fitting provides faster start up of the fitting process for the patient at
the peak of motivation and also provides rapid exchange or replacement of lenses
when necessary
E. All diagnostic lenses must be carefully cleaned and then asepticized before
being put back into inventory or diagnostic use.
18. Misc.
A. The object is to fit the smallest possible lens that permits the full coverage of
the cornea
B. Allow at least 10 minutes after initial lens has been placed on the eye for
equilibration of tears
C. Less movement can be accepted with spin cast lenses and high water/ultra-
thin SCLs
D. Low plus lenses
1. Due to thick centers, lens designs are subject to lid and gravity influences, and
frequently position low on the eye
2. Due to thickness, edematous changes are more probable and require good
movement and venting
3. The higher the plus, the more these problems appear.
4. Aphakics are dry eyed and protein/mucus, lipid binding is an extra problem