

NCLE Basic Exam Review

Domain IV: Prefitting



Developed by the National Federation of
Opticianry Schools

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9:45 AM – 10:45 PM

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Mr. Steven B. Indelicato has no financial interests to disclose.

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Domain IV: Prefitting (14%)
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I. Fitting & Evaluation:

A. Soft Lens Indications:

- a. Cosmetics
- b. Better Vision especially at the periphery
- c. Prosthetic use

B. Advantages:

- a. Lenses are more comfortable than conventional rigid lenses
- b. Easily Adaptable
- c. Flexible Wearing Schedule
- d. Less debris gets under the contact lens
- e. Safer lens for athletics/will not dislodge as easily compared to rigid lenses

C. Disadvantages:

- a. Vision not as sharp as rigid lenses
- b. Is more fragile than rigid lenses
- c. GPC and infections are more common with soft lenses compared to rigid lenses

D. Soft Lens Classification:

- a. Mini – 12.5 mm – 13.0 mm
- b. Para-Limbal – 13.5 mm – 14.5 mm
- c. Semi-Scleral – 14.5 mm – 16.0mm
- d. Water Content
- e. Low Water – 30% - 40%
- f. Medium Water – 50% - 60%
- g. High Water – 60% - 80%
- h. Center Thickness
- i. Normal - .10 mm or more
- j. Thin - .05 mm to .10 mm
- k. Superthin or Ultrathin - .035mm - .04mm

E. Lens Materials & Design:

- a. HEMA – Hydroxymethylmethacrylate
- b. HEMA + Other Polymers
- c. Silicone Hydrogel
- d. Silicone
- e. Spherical Lenses
- f. Toric or Astigmatic Lenses
- g. Bifocals or Multifocals

F. Types of Hydrogel Modalities:

- a. *Daily Wear (Conventional Wear)* – is worn during waking hours. 12-13 hours. Replace every 12 months
- b. *Extended Wear* – may be worn during sleep usually up to 7 days. FDA regulations state 14 days and new silicone hydrogel lenses are approved for 30 days
- c. *Flexible Wear* – can be worn as both a daily wear and extended wear lens
- d. *Disposables* – These lenses can be slept with and used as a Daily wear lens
- e. *Disposable “Dailies”* – are discarded after one day of use every day. Usually comes in 90 and 30 day supplies packs
- f. *Planned Placement* – involves scheduled replacement of lenses from every month or three months as determined by eyecare professional

G. FDA Classification of Hydrogel Materials:

- a. The FDA has classified hydrophilic lens materials according to their water content and ionic charge
- b. The rationale for this classification is the fact that water content and ionic charge determine how a hydrogel lens material will interact with contact lens solutions
- c. The FDA gives every lens material a generic name
- d. Hydrogel lenses are categorized into five groupings
- e. These groupings take into account water content (Low Water or High Water and Surface reaction (Ionic and Nonionic)
- f. Group I (< 50% H₂O) Nonionic Hydrogel Polymers
- g. Group II (> 50% H₂O) Nonionic Hydrogel Polymers
- h. Group III (< 50% H₂O) Ionic Hydrogel Polymers
- i. Group IV (> 50% H₂O) Ionic Hydrogel Polymers
- j. Group V – is in the process of being evaluated and subdivided

H. Groups:

- a. **Group I:** Low Water (<50%) – Nonionic
- b. Have lower Dk values and low water content and are not generally suitable for extended wear except in an ultrathin design.

- c. Due to their neutral charge and low water content, these classification of lenses are generally least deposit prone
- d. **Group II: High Water (>50%) – Nonionic**
- e. Have higher Dk values and are therefore used for extended wear
- f. Their neutral, non-ionic nature makes them more resistant to deposit formation than ionic water lenses
- g. **Group III: Low Water (<50%) – Ionic**
- h. The negative charged surfaces provide greater attraction for positively charged tear proteins and lipids
- i. Group 3 lenses tend to exhibit more deposits than lenses in nonionic groups
- j. The low water and low Dk values make this group suitable only for daily wear lenses, except in some ultrathin designs
- k. **Group IV: High Water (>50%) – Ionic**
- l. This group is used primarily for extended wear (They provide good oxygen transmission)
- m. The ionic nature combined with the high water content causes these lenses to be the most reactive with solutions and the most prone to deposit formation
- n. This group is more prone to dehydration and may yellow prematurely if heat treated

I. Manufacturing and Parameter:

- a. Spin Casting, Lathe Cutting, Cast Molding
- b. Parameters- base curve, power, diameter, water content, availability

J. Fitting Techniques:

- a. Soft lenses are fitted flatter than the flattest “K” reading
- b. A normal fitting soft lens should have a “3 Point Touch”
- c. Keratometry should be used as a starting point in the fitting process
- d. Spherical soft lenses do not neutralize corneal astigmatism, therefore the amount of refractive astigmatism should be limited to .75 – 1.00 D.
- e. With borderline astigmats, sometimes a thick or stiffer soft lens might mask some corneal astigmatism

K. Patient Selection:

- a. Motivation
- b. Personal Hygiene
- c. Willing to comply with all directions, instructions and restrictions for proper lens wear and aftercare
- d. Appropriate refractive error based on manufacturer availability

L. Criteria for a Well Fitted Soft Lens

- a. Good Centration and Corneal Coverage
- b. Adequate Movement
- c. Stable and Consistent Vision
- d. Comfort
- e. Undistorted Keratometer Reflex
- f. Good Retinoscopic Reflex

M. Good Centration and Corneal Coverage:

- a. The soft lens should be large enough to cover the entire cornea
- b. The soft lens should be reasonably well centered
- c. Establish a 3 Point Touch
- d. Initial Selection should be determined by measuring the HVID and Palpebral fissure
- e. Rule of Thumb – add 2 mm to the HVID as a starting point

N. Movement:

- a. Factors to Consider: Base Curve, Water Content, Diameter, Thickness, Eyelid Forces
- b. Thin soft lenses move less than soft lenses that are thicker
- c. Thin soft lenses usually have a lower water content
- d. Thicker soft lenses usually have a higher water content
- e. Contact Lens Practitioners should be aware of the lens materials that they are fitting

O. Movement Characteristics and Evaluation:

- a. Primary Gaze – lens should move .5mm – 1mm with the blink
- b. Upward Gaze – lens should drop .5 mm – 1mm
- c. Ideal Movement – 1mm – 2 mm
- d. Evaluation – Slit Lamp
- e. Push Up Test
- f. When a patient blinks, the vision should be clear and crisp before and after the blink
- g. Variable vision may indicate a problem with the fit, improper power of the contact lens or residual astigmatism
- h. During the initial fitting, variable vision is to be expected until the contact lens settles in
- i. If the vision does not improve with Over-refraction, an astigmatic clock should be used to evaluate the presence of residual astigmatism

P. Fitting:

- a. Keratometer readings and Corneal Diameter (HVID) help determine the starting base curve for a soft lens
- b. Lens Selection: Transpose/ $\frac{1}{2}$ the cylinder power added to the sphere
- c. Guidelines
- d. Use flattest "K" as your reference point
- e. 42.00 or $<$ - Choose an 8.90
- f. 42.00 – 45.00 – Choose an 8.90
- g. 45.00 – 46.00 – Choose an 8.60
- h. 46.00 or $>$ - Choose an 8.30

Q. Characteristics of a Flat or Loose Fit:

- a. Variable Vision
- b. Awareness
- c. Excessive Movement
- d. Edge Standoff
- e. Lens may fall out
- f. Vision is clear before the blink and blurry after the blink
- g. Keratometer reflex blurs after the blink
- h. Lens displacement
- i. Some Lenses that are **Loose or Flat**, may ride high
- j. This is usually seen in a minus lens and not in a plus lens because of the edge thickness
- k. **Correction-** Switch to a larger Diameter or Steeper base curve or combination of both. In clinical practice, you will probably only change the base curve.
- l. **Steep or Tight Fit:** Lens is initially comfortable but becomes more uncomfortable as the day goes on
- m. Keratometer Reflex blurs before the blink
- n. Vision improves after blinking
- o. **Correction:**
- p. Switch to a smaller or flatter base curve or a combination of both
- q. Visual Acuity with Astigmatism
- r. Follow up

R. Optics of Contact Lens and Spectacles

- a. **Convergence with contact lenses compared with spectacles:**
- b. For a myope there is *base-in* prism for convergence
- c. For a hyperope there is *base-out* prism for convergence
- d. When a myope converges with spectacles, *less* eye convergence is needed

- e. When a myope converges with spectacles, less eye convergence is needed.
- f. When a myope converges with contact lenses, more eye convergence is needed
- g. When a hyperope converges with spectacles, more convergence is needed
- h. When a hyperope converges with contact lenses, less convergence is needed

S. Accommodation with contact lenses compared with spectacles

- a. When a patient changes from spectacles to contact lenses, there is a change in the amount of accommodation to focus at an object which is at a fixed distance
- b. A myope does not need to accommodate as much with spectacles as with a contact lens correction
- c. A hyperope does not need to accommodate as much with contact lenses as compared to their eyeglasses
- d. Magnification effects of contact lenses and spectacles
- e. **Myope:** retinal image is enlarged with contact lenses and minified with spectacles
- f. **Hyperope:** retinal image is enlarged with spectacles and minified with contact lenses
- g. When fitting a pre-presbyope, accommodation and convergence requirements should be analyzed carefully to meet the visual expectations of the patient.
 - a. **Presbyopia**, is also known as the “short arm syndrome”
 - b. The natural lens can no longer control the eye’s way of changing its focusing distance
 - c. The lens thickens, increasing its inability to focus close-up.
 - d. At about the age of 40, the lens becomes less flexible and accommodation is gradually lost.
 - e. It’s a normal process that everyone eventually experiences.
- h. **Accommodation-** the adjustment in lens shape of the crystalline lens to focus at various distances
- i. **Signs and Symptoms:** Difficulty seeing clearly for close work, Print seems to have less contrast, Reading material must be held further away to see

T. Bifocal Contact Lenses:

- a. **Good** Candidates:
 - a. Motivated Patients
 - b. Vision demands are not very critical
 - c. Normal lid tonicity
 - d. Good ocular health and good tear quality
- b. **Bad** Candidates:
 - a. Unmotivated
 - b. First time contact lens wearers
 - c. Poor tear quality
 - d. Irregular Cornea
 - e. Amblyopia

U. Reading Glasses over Contact Lenses:

- a. Full distance prescription in contact lenses (Rigid, Soft, Disposable, Extended Wear, Astigmatic)
- b. Add Power in Glasses
- c. Excellent optical system
- d. Cosmetically unacceptable
- e. Will need to put glasses on every time patient wants to read
- f. May have a problem just looking down doing simple tasks

V. Compromise Rx with Distance Glasses:

- a. Single vision contact lenses (Rigid, Soft, Disposable, Astigmatism, Extended Wear)
- b. Under correct myope by 1.00 or so
- c. Overcorrect Hyperope by 1.00 or so
- d. Good only for early moderate presbyopes
- e. Reduced distance acuity to improve near vision
- f. Put under correction or overcorrection in glasses
- g. Beware of Driving Requirements

W. Monovision:

- a. correcting one eye for distance and one eye for near
- b. Can be done with GP lenses, Soft, Disposable, Extended Wear, Astigmatic lenses
- c. 75% success rate
- d. Uninterrupted vision out of each eye separately
- e. Alters binocular vision
- f. **Fitting:**
 - a. Determine distance correction

- b. Determine near add and ranges
- c. Determine dominant eye
- d. Demonstrate with trial fitting
- e. Advise patients to avoid driving or operating dangerous machinery during the first 2 – 3 weeks of adaptation
- f. Eye dominance
- g. **Modified Monovision-** One eye is fit with a single vision contact lens and the non-dominant eye is usually fit with the multifocal design

X. Simultaneous Vision:

- a. Entrance pupil exposed to both distance and near at all times (Soft and Rigid)
- b. Eye accepts rays of light that permit focus at near and far
- c. Design for Distance and Near can vary
- d. Lens design does not require prism for stabilization

Y. Alternating (Translating) Vision:

- a. Are prism-ballasted/truncated lens designs (Rigid lenses)
- b. They utilize the lower lid for translation
- c. Used for patients having critical vision demands
- d. Various add powers for moderate to advance presbyopes
- e. Inability to provide intermediate vision
- f. Good centration and translation needed for success

Z. Aspheric Multifocals:

- a. Have a gradual change in curvature based on “E” Value – Eccentricity
- b. Aspheric surface (front or back)
- c. Aspheric GP Multifocals have better optical quality than soft lenses
- d. Fit steep to center lenses

AA. Fitting Pearls for Soft Multifocal Lenses:

- a. Start with steeper base curve
- b. Remind patients that lighting is important and adjust working distance
- c. Use normal room illumination
- d. Let lenses settle for 15-20 minutes
- e. Assess vision binocularly
- f. Use handheld lenses to overrefract
- g. Overrefract in .25 steps
- h. Overrefract monocularly with both lenses open and recheck any overrefraction at near and distance
- i. Use everyday reading material
- j. Test vision at the distance required by the patient (e.g. computer operator needs intermediate vision and may accept reduced near vision)

- k. It is acceptable to use unequal add powers
- l. It is acceptable to use two different multifocal brands

BB. Edge Design

a. Hyperflange/ CN Bevel

- a. If a high minus lens is riding too high or the edge of the lens is too thick, but the base curve relationship is adequate

b. Myoflange

- a. If a high plus is riding too low, a minus carrier lenticular can be designed to pull the lens under the upper lid and center the lens after the blink

CC. Residual Astigmatism:

- a. an astigmatic error left over after a contact lens is placed on the eye
- b. Usually associated with ATR astigmatism and Internal Astigmatism
- c. Reduced Acuity
- d. Shadows around images
- e. .50 to .75 D of uncorrected residual astigmatism is usually tolerated by patients
- f. Soft Lenses do not neutralize corneal astigmatism but drapes the cornea

DD. Toric Lenses

- a. New Astigmatic Patients
- b. Soft Lens Patients with Residual Astigmatism
- c. Astigmatic Patients who want to wear Extended Wear and Disposable/Frequent Replacement Lenses
- d. Designs**
 - a. Prism
 - b. Truncation
 - c. Thin zones or Double Slab Off
 - d. Peri-Ballast
 - e. Combination Designs
- e. Soft Toric Cylinder Surfaces**
 - a. Soft Toric lenses are made with the cylinder manufactured on the front
 - b. Soft Toric lenses are made with the cylinder manufactured on the back
- f. Availability
- g. Fitting Guide
 - a. Transpose Rx in minus cylinder form
 - b. Compensate for Vertex distance $> \pm 4.00$
 - c. Follow same procedure for choosing a base curve for soft lenses

- d. >45.00 - fit 8.6 or 8.7
- e. <45.00 – fit 8.7 or 8.9

i. Vertex Distance:

- a. Minus Prescriptions from -4.00 on take less minus at the cornea
- b. Plus Prescriptions from +4.00 on take more plus the cornea

j. Compensate for Axial Alignment

- a. Locate base prism mark or lens marking consistent with that lens brand
- b. Estimate displacement from center line
- c. Compensate Axis from Spectacle Rx

k. Mislocation

- a. Observe then measure and correct
- b. ‘LARS’ – LEFT ADD, RIGHT SUBTRACT
 - i. Example
 - 3.00 – 1.75 x 180
 - ii. Lens rotates to the right by 20 degrees
 - iii. LARS!
 - iv. Left Add
 - v. Right Subtract
 - vi. $180 - 20 = 160$
 - vii. Lens to be ordered:
 - viii. $-3.00 - 1.75 \times 160$
- c. If relative difference is clockwise, **ADD** difference to the Spectacle Rx not the Trial lens axis
- d. If relative difference is counterclockwise, **Subtract** difference from Spectacle Rx not the Trial Lens Axis

l. Over-Refraction

- a. The last step in Astigmatic lens fitting
- b. Over-Refraction – If the trial lens has a cylinder power, Over-Refract with spheres ONLY!

m. Cylinder Axis Orientation

- a. Cylinder Axis ordered is only correct if lens continues to orient at the position compensated for

n. Front Toric Soft Lenses vs. Back Toric Soft Lenses

- a. If all astigmatism is on the cornea, choose a soft toric design where the cylinder is ground on the back
- b. This provides better physical fit and has a better stabilizing effect on the eye
- c. Ex: $-3.50 - 1.75 \times 180$ “K” $42.00/43.75 \times 90$

- d. If most of the astigmatism is internal, choose a soft toric lens that has the cylinder ground on the front.
- e. Ex: $-2.75 - 1.75 \times 180$ "K" $42.25/42.75 \times 90$

o. Spherical Equivalent

- a. $\frac{1}{2}$ the refractive cylinder added to the sphere