NCLE Basic Exam Review
Domain V: Diagnostic Fitting

Developed by the National Federation of Opticianry Schools

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VISION EXPO

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

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I. RGP Fitting and Evaluation

A. **Rigid Gas Permeable Materials**:

a. PMMA, CAB, Silicone/Acrylate, Silicone, FSA-Fluorocarbon Silicon Acrylate
b. PMMA – 1947 – 1971
c. Complications of PMMA-Corneal Edema, Overwear Syndrome, Corneal Anesthesia
d. Why Gas Permeable? Reduce Corneal Edema, Corneal Warpage, Polymegethsim
e. Advantages:
    i. Crisper Vision
    ii. More Durable than Soft Lenses
    iii. Aftercare of lenses is easier
    iv. No need to change lenses every year, lenses can be cleaned and polished
    v. Patients are more loyal
    vi. Stabilizes Myopia in teenagers and reduces "Myopic Creep"

B. **Oxygen Permeability/Oxygen Transmissibility**:

a. DK= Oxygen Permeability
b. DK/L = Oxygen Transmissibility
c. Atmosphere = 21% Oxygen
d. Thickness affects Oxygen Transmission

C. **1st Generation of GP's:**

a) Classified as Silicone Acrylate except CAB
b) Boston II
c) Paraperm O2
d) Optacryl 60
e) SGP
f) Polycon I

D. **Second Generation of GP's:**

a) Boston IV
b) Paraperm O2+
c) Optacryl K
d) SGP II

e) Polycon II

E. **Third Generation of GP's - FSA – Fluorinated Silicone Acrylate**

a. Boston ES, EO, XO, RXD
b. Paragon HDS, HDS 100
c. Fluoroperm 30,60,90,151 & Paragon Thin
d. Fluorox 300,500,700
e. SGP III

F. **Fourth Generation of GP's**

a. Still classified as FSA - higher DK value, lower wetting angles and more manufacturing stability
b. Optimum Classic, Comfort, Extra, Extreme
c. Hybrid FS, Hydro 2, Menicon Z

G. **Fitting GP Lenses**

a. Considerations should involve: DK Value, Wetting angle, and Specific Gravity, Tint Availability
b. Many GP lenses today come with UV absorbers.
c. **Procedure**:
    i. Health History
    ii. Refraction
    iii. Pre-fitting examination with Slit Lamp
    iv. Keratometry
    v. Lens Options (Spherical Lenses, Toric Lenses) (Rigid or Soft?)
d. **Methods**: Empirical & Trial Lens Fitting
e. Intrapalpebral Fitting:
    i. Use of Fitting Rules
    ii. Fit "On K" or "Steeper than "K"
    iii. Diameters 8.5 – 9.2
    iv. Edges should be well tapered to minimize edge sensation with the upper lid

H. **Parameters:**

a. When designing a spherical contact lens, the contact lens practitioner must have an understanding of how each of the above parameters may affect the fit of the contact lens.
b. Concerns for a successfully fit contact lens: Vision, Comfort and not affecting Corneal Physiology
c. **Sagital Depth**: Measurement from the flat plane at a given diameter to the highest point of a concave surface of the contact lens – also described as the degree of corneal elevation for a given chord diameter

d. Apical Vault = S1 – S2
   S1 = Sag of the Cornea
   S2 = Sag of the Contact Lens

e. Apical Vault is formed because the radius of the cornea flattens outside the apical zone but the radius within the POZ remains constant.
f. As long as the curvature of the cornea is less than the curvature of the contact lens, apical vault will be formed

g. **CENTRAL POSTERIOR CURVE –** If the POZ is kept constant and the CPC is made steeper, Apical Vault is increased therefore lens movement is decreased forming a tighter fit. Ex. Change base curve from 7.80 to 7.70 *Any change in the base curve requires a new lens.*
h. If the POZ is kept constant and the CPC is made flatter, Apical Vault is decreased therefore lens movement is increased forming a looser fit. Ex. Change 7.70 to 7.80

i. **POSTERIOR OPTICAL ZONE –** If the CPC is kept constant and the POZ is made smaller, Apical Vault will be decreased and therefore increase lens movement. Ex. Change POZ from 8.0 to 7.0 *If you make the POZ smaller, this does not require a new lens and can be made by adjustment of the original lens.*
j. If the CPC is kept constant and the POZ is made larger, Apical Vault will increase and therefore decrease lens movement. Ex. Change POZ from 7.0 to 8.0 *If you want to make the POZ larger, you have to order a new lens.*

k. **Small POZ** → decrease sagittal value of the lens, decrease Apical Vault → increase lens movement →loosen the fit of the contact lens.
l. **Larger POZ** → increase sagittal value of the lens, increase Apical Vault → decrease lens movement → tighten the fit of the contact lens.

m. **DIAMETER** – As diameter increased, the POZ is usually increased accordingly. As this occurs, apical vault increases increasing therefore tightening the fit of the lens. *If you want to make the diameter larger this will require a new lens.*
n. As diameter is decreased, the POZ is usually decreased accordingly. As this occurs, apical vault decreases and loosens the fit of the contact lens. *If you want to make the diameter smaller, this can done by adjustment and does not need a new lens.*

o. **THICKNESS –** As thickness decreases, surface tension will increase causing a tighter fit. As thickness increases, this will loosen the fit of the lens. *Any change in thickness requires a new lens.*

p. **PERIPHERAL CURVES –** If peripheral curves are made wider, and will decrease the size of the POZ, apical vault will decrease which will loosen the

fit of the contact lens. *Widening peripheral curves can be done by adjustment on the original lens. Peripheral curves cannot be made smaller and will require a new lens. If the fitter wants a larger POZ, a new lens will have to be ordered.*

q. **POWER** – corrects the patient's refractive error. In a minus lens, up to 1.00 D of minus can be added to the original lens with reordering a new lens. *It is recommended that no more than .50 D of power be added to an original contact lens.* For plus lenses, up to .50 D of power can be added to the original lens.

r. When the contact lens fitter uses the terms **TIGHT** and **LOOSE**, this refers to movement of the lens.
s. When the contact lens fitter uses the terms **STEEP** and **FLAT,** this refers to apical vault and the amount of tears under the lens. A lens that is tight is steep and a lens that is flat is loose. These terms also refer to the central lens corneal relationship that was discussed in previous lectures

I. **Fittings:**

a. Intrapalpebral Lens:
b. Transpose Rx in minus cylinder
c. Compensate for Vertex Distance >+/- 4.00
d. Select a trial lens consistent with a fitting philosophy
e. Usually On "K" or Steeper than "K"
f. Ex:
g. Given the following information: K's 45.00/44.00 @ 90
h. Rx -3.00 +1.00 x 180
i. -2.00 – 1.00 x 90
j. 44.00, -2.00 starting base curve and power if lens if fit on "K"
k. Fitting an intrapalebral lens a base curve "on K" or steeper than "K" should be chosen

l. Superior Lid Alignment/Upper Lid Attachment:
m. Transpose Rx in minus cylinder
n. Compensate for Vertex Distance >+/- 4.00
o. Select a trial lens consistent with a fitting philosophy

p. Diameter Lens Selection
i. Lens Diameter is determined by:
ii. Lid Position
iii. Pupil Diameter
iv. Palpebral Fissure Size
v. Corneal Astigmatism (The greater the astigmatism, the smaller the diameter, the flatter the cornea, the larger the diameter)

vi. HVID – measure the cornea – Does the patient have a small, average or large cornea?

J. **HVID Measurement**

a. Large Cornea > 12 mm – Choose a 9.5 or >
b. Average Cornea (10.5 – 11.5) – Choose between a 9.2 – 9.4 Diameter
c. Small Cornea < 10 mm – Choose a 8.8 – 9.0 Diameter

K. **SAM – FAP**

a. Steeper Add Minus

i. 05 mm = .25 D in Tear Lens Power
ii. 7.80, -2.00 → 7.75 = .05 mm steeper → Power needed at cornea = -2.25 D

b. FAP – Flatter Add Plus

i. .05 mm - .25 D in Tear Lens Power
ii. 7.80, -2.00 → = .05 mm flatter → Power needed at cornea = -1.75D

c. **Example 1**: If a patient is fit with the following lens, 44.50, -4.50 and the base curve is changed to 45.00, what is the new base curve and power?
d. 44.50, -4.50 SAM .50 = -.50
e. New Rx = 45.00, -5.00

f. **Example 2:** If a patient is fit with a 7.65 mm base curve and the Rx is +4.00. What prescription would be needed if we change the base curve to 7.55?
g. 7.65, +4.00 D
h. SAM
i. 7.55, .10 mm = .50
j. Answer 7.55, +3.50

L. **Base Curve radius is based on Diameter And Corneal Astigmatism**

a. **Example:** -2.00 –1.00 x 180
b. "K" 42.00@180/43.00@90
c. If you fit a 9.5 – base curve selection is .50 D flatter than "K" Upper Lid Attachment is achieved
d. Recommendation: 41.50, -1.50, 9.5

M. **Fluorescein Pattern Evaluation:**

a. Fitting Procedure for GP Lenses involves an additional step over Soft Lens Fitting
b. Pre-fitting and Evaluation
c. Diagnostic Trial Fitting (Establish Fit first)

d. Over-Refraction
e. Fluorescein Evaluation
f. Write up Lens order
g. Slit Lamp

N. **Correction of a Low Riding Lens (Minus Lens)**

a. Intrapalpebral Fit (Lens may be too flat)
b. -Steepen base curve

c. Upper Lid Attachment (Lens may be too steep)
d. -Flatten base curve or increase lens diameter or combination of both

O. **Correction of a High Riding Lens (Minus Lens)**

a. Intrapalpebral Fit (Lens may be too flat) Note: This is if edge of lens is slightly under upper lid
b. -Steepen base curve or increase lens diameter

c. Upper Lid Attachment (Lens may be too flat)
d. -Steepen base curve or increase lens diameter or combination of both
e. - Thin out edge design (CN Bevel or Hyperflange design)

P. **Lens Flexure:**

a. New GP lenses are thinner
b. If vision fluctuates, either:
c. Flatten base curve first or
d. Increase CT by .02 - .04
e. Depending on corneal toricity sometimes new GP lens materials will bend on the eye after blinking

Q. **GP Contact Lens Care:**

a. GP lenses need to be disinfected for a minimum of 4 hours after wearing
b. Prior to delivering lenses to a patient, GP lenses should soak overnight in order for the lenses to be more wettable prior to the patient wearing their lenses
c. GP lenses should be cleaned and polished professionally once a year
d. Solutions – Deposits
e. Decreased Mucous/Protein Adhesion = Comfort, Wettability and Oxygen Permeability

R. **Contact Lens Adjustments:**

a. Adjustments to an original lens:

i. Cut down diameter
ii. Increase PC width, reduces POZ
iii. Reduce POZ
iv. Round out edges
v. Clean and Polish scratches
vi. Smooth out peripheral curves
vii. Add -.50 to – 1.00 of minus power
viii. Add +.50 to Plus lenses
ix.

b. Adjustments that require a new lens:

i. Increase Diameter
ii. Change Center Thickness
iii. Make POZ larger
iv. Add more than 1.00 of minus power
v. Add more than .+.50 of plus power
vi. Change Base Curve

S. **Stippling**:

a. Minute air bubbles get trapped under lens
b. Mucous debris under lens
c. Check Fit
d. Clean and Polish lens and review cleaning

T. **Punctate Staining:**

a. Air bubbles getting trapped under lens
b. Dirty lens
c. Check fit of lens
d. Review cleaning procedures

U. **Abrasion:**

a. Fit of lens that is too flat
b. Foreign body gets trapped under lens
c. Eye Patch overnight

V. **3&9 O'clock Staining / Peripheral Staining:**

a. Improper blinking
b. A low riding RGP lens
c. Stress the importance of blinking, Blinking exercises, Eye lubricant

d. Flatten base curve or increase lens diameter

W. **Dimple Veil:**

a. Not a stain but excessive air bubbles trapped under a lens
b. Usually a lens that is too steep or too flat at the edge periphery

X. **Arc Stain:**

a. Crescent shaped stain from improper insertion, rough edge of contact lens or improper recentering of contact lens