EXAM PREPARATION

For Contact Lens Dispensers

Part

3

Fitting & Verification

PROPERTY OF
MANAGEMENT DEVELOPMENT

EXAM PREPARATION

FOR CONTACT LENS DISPENSERS

3: Fitting & Verification

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Introduction

In part 3, Fitting & Verification, we'll be applying that which we've studied in the previous two sections about lens materials and designs and optical principles toward the actual fitting of rigid and soft contact lenses. How big should a contact lens be? When should it be fit on K, or steeper or flatter than K? What about its thickness and peripheral curves? These questions will be addressed in this section.

Although PMMA lenses are rarely fit today, the principles one needs to apply in fitting them are fundamental to all rigid lenses and will therefore be covered in this session. We'll begin with a discussion of palpebral lenses as well as larger lenses with wide preipheral curves. The general characteristics, advantages, and disadvantages of each will be discussed. This will be followed by methods and procedures for selecting base curve, diameter, optical zone width, peripheral curves, and thickness through the use of diagnostic lenses, nomograms and charts. Examples and practice exercises are included.

Dynamic flourescein patterns are used to assist in the evaluaton of the fit of rigid contact lenses. How and why this is accomplished is covered in the second half of Part 3. We'll illustrate flourescein patterns of a spherical base curve on a spherical cornea, and spherical base curves on a toric cornea are presented. Astigmatism with the rule, against the rule, and oblique will be discussed and observed. Soft lens evaluation is then covered to include fitting goals and the characteristics of a good fitting soft lens.

Part 3 concludes with a presentation of rigid and soft lens verification techniques to include the use of the measuring hand magnifier, diameter gauge, projector inspection devices, slit lamp, radiuscope, thickness gauge, lensometer, and profile analyzer. We'll see that soft lenses too can be verified through the use of a hand magnifier, plastic templates, a soft lens analyzer, and the use of a water cell.

This section will conclude with a thirty-four question practice test based on the material covered.

3: Fitting & Verification

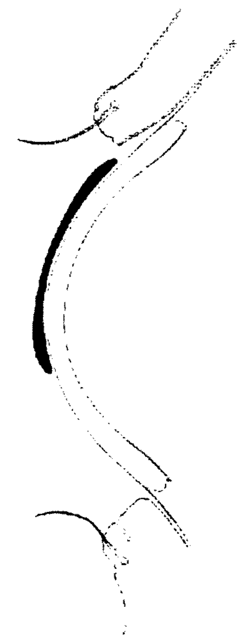
Rigid Lenses

Smaller steeper corneas

The Information for the first half of Part3, Fitting & Verification may be found on Tape 4, side 1. The first time through, follow along in the workbook as you listen to the tape. Notes may be taken as needed on subsequent listenings.

Two broad categories of rigid contact lenses would include the *Palpebral Lens* and the larger *Lid Attachment Lens.*

THE PALBEBRAL LENS:



General characteristics: The lenses are small and thin. They are small enough to be contained within the cornea with little or no contact with the upper or lower lids. Diameters usually range from 7.8 to 8.6 mm. With each blink the lens moves up and approaches the superior limbus. Between blinks, in ideal cases, it falls slowly toward the inferior limbus lowering to just below the center. Thicknesses are generally in the range of 0.08 and 0.12 mm. and the peripheral curves are relatively steep.

The lenses should be large enough to provide a minimal sense of motion during blinking producing as little glare as possible. However, too large a lens can result in reduced comfort. The thinness of the lens results in some flexure with each blink which creates a tear pump that can help with tear exchange.

Advantages:

1 It provides excellent tear exchange resulting in minimal corneal edema and spectacle blur.
2. Eye movement is free from lid irritation since the lens is smaller than the palpebral fissure.
3. The thinner lenses are more comfortable than conventional lenses and can therefore be employed as a possible alternative to soft lenses especially when a significant amount of corneal astigmatism is present.
4. A high riding rigid lens problem may be solved through the use of the small microthin lenses which may center better.
5. Patients who have induced corneal astigmatism caused by the the "molding" effect of larger lenses may benefit from a smaller microthin lens.

larger corneas flatter - larger flatter lens
Smaller - steeper - steep small CL

Rigid Lenses

Disadvantages:

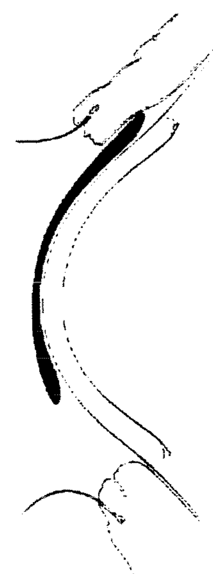
1. The interpalpebral lens should not be used where the lens is likely to be high riding, such as in severe myopia. Their thinness can actually carry the lenses higher.
2. They can be difficult to remove. Their thin edge makes it difficult for the upper lid to dislodge the lens.
3. In cases of high corneal astigmatism, they don't center particularly well.
4. They warp relatively easily, are difficult to modify because of their size, and because of their thinness, they are easier to damage or break in handling.
5. Patients with large pupils often complain of "flare." light passes thru peripheral & enters pupil.

LARGER LENSES WITH WIDE PERIPHERAL CURVES:

for larger flatter corneas

General Characteristics: The lens diameter is approximately 9-10 mm and contains a large optic zone of 7-8 mm. It often assumes the shape of a tricurve lens with the radius of the intermadiate curve 1 mm flatter than the base curve and the radius of the peripheral curve 1 mm flatter than that of the intermediate curve.With blinking the lens attaches to the upper lid and is lifted high and may even override the superior limbus. As we'll see later on, a high riding lens may also be achieved through the use of a minus carrier.

A larger lens of this type may be indicated by a flat, large cornea-over 11 mm or flatter that 44.00 diopter, or by a large palpebral aperature of 10 mm or greater. It can also be useful when smaller lenses result in poor centration. When made of PMMA, these lenses can only be tolerated by about 20-30% of patients. However considerably greater success is achieved when the newer gas permeable materials are used.



Advantages:

1. The larger optic zone can minimize or eliminate the annoying flare often seen with smaller lenses.
2. The wider peripheral curves hold a large reservoir of tear fluid that aids in cushioning the lens and assists in tear exchange.
3. The larger size enables the lens edge to remain under the upper lid during blinking.
4. Spherical lenses can correct for up to 3.00 to 4.00 diopters of corneal astigmatism.
5. The lenses center well, are stable, and are easy to handle.

Rigid Lenses

Disadvantages:

1. There is an increased risk of corneal molding due the the bulk of the lens which can induce up to 5.00 to 6.00 diopers of corneal astigmatism.
2. Not practical for patients with small palpebral fissures, or small, steep corneas.
3. Lenses can only be tolerated by about 20-30 percent of patients. Although it is less comfortable at first, a surprising degree of adaption can be achieved after a few weeks.
4. Peripheral curves must be precisely designed or lenses can become very loose.

(The newer gas permeable materials have solved many of the problems associated with large PMMA lenses. The advantages still stand.)

Fitting Methods

Trial Lens Method:

The trial lens or "diagnostic lens" method is the most accurate method of fitting contact lenses. It allows for a close estimate of proper lens size, power, and curvature and it enables the fitter to evaluate what if any edge modifications may be necessary. Since only about half the population can tolerate sensitivity to any type of rigid contact lens, a trial lens allows the wearer to evaluate their particular sensitivity to hard lenses.

Although trial lenses are generally composed of PMMA they can approximate the fitting characteristics of most gas permeable rigid lenses. However some gas permeable materials such as CAB are lighter in weight and this needs to be taken into account. Trial lenses made of the actual gas permeable materials are available and may be used but at a higher cost.

SUGGESTED STANDARD HARD TRIAL LENSES

I. **Myopic**

A. Minimal set
1. Base curves from 7.30 to 8.30 mm in steps of 0.10 to 0.20 mm
2. Diameter 8.5 mm
3. Power -3.00

B. Larger set (to be added to the minimal set)
1. Same base curves (or, 7.40 to 8.40 mm)
2. Diameter 9.2 mm
3. Powers of -3.00 and -8.00 (also for 8.5 mm set, if desired)

C. Comprehensive set
1. Same base curves and steps
2. Diameters of 7.5, 8.0, 8.5, 9.0, and 9.5 mm
3. Powers of -3.00, -8.00

II. **Low Plus**

A. 8.5 mm diameter
1. 7.30 to 8.30
2. +3.00
3. single-cut

B. 9.2 mm diameter
1. 7.40 to 8.40
2. +3.00
3. minus carrier

III. **Aphakic**

A. 8.5 mm diameter
1. 7.5 to 8.4 mm
2. +14.00
3. single cut

B. 9.3 mm diameter
1. 7.60 to 8.50 mm
2. +14.00
3. minus carrier

Nomogram - 1 type is

Dyer Chart Method:

Contact lenses may also be fit according to a chart. One widely used method is through the use of the Dyer chart. Here the fitter would follow the following procedure.

Fitting Methods

Base Curve: locate the flattest corneal meridian in the left hand column of the chart. Then locate the amount of corneal astigmatism in the appropriate column to the right. Note the base curve indicated.

Diameter, Optical zone, and Peripheral Curves: once the base curve is determined, refer to the Dyer chart for other lens parameters and find the base curve in the left hand column. Note the other parameters indicated.

Power: To calculate the correct power of a rigid contact lens, first convert the spectacle prescription to minus cylinder form. Then drop the cylinder and axis completely. If necessary, compensate the power for vertex distance. The resultant sphere power would then correspond to the power of the lens. This power calculation assumes the lens is being fit "on K." If the base curve varies from the flatter corneal meridian, that difference in diopters must be taken into account when considering the power of the contact lens.

Hartstein Modification:

This method stresses the value of taking measurements to determine final dimen sions of the contact lens. It uses two basic parameters to arrive at the dimensions of the contact lens—corneal diameter and pupillary size.

corneal diam & pupil size

Lens Diameter: To determine the lens diameter, add 4 mm to the size of the pupillary diameter. For example, a pupil with a diameter of 4.3 mm would require a lens size of 8.3 mm. In the case of larger corneas, 12 mm or more, add 0.5 mm to the overall diameter, for smaller corneas, 10 mm or less, reduce the diameter by 0.5 mm.

Optic Zone: The size of the optic zone is simply 1.5 mm smaller than the overall lens diameter.

Secondary Curve: Should be 0.75 mm wider than base curve and 5.00 D flatter.

Thickness: The standard thickness for a plano lens is 0.16 mm. For each diopter of minus power, 0.01 mm is subtracted from the center thickness. For each diopter of plus power, 0.02 mm is added to the center thickness.

Base Curve: The base curve is fit 0.25 to 0.50 D steeper than K. It there is between 0.50 and 2.00 diopters of corneal astigmatism, a spherical lens is ordered parallel to the flattest corneal meridian, or "on K." If the corneal astigmatism falls between 2.00 and 3.00 diopters, it would require a lens 0.50 D steeper than K. Any astigmatism over 3.00 D would indicate the use of a toric contact lens.

Examples

Example 1:

Spectacle Rx: -3.25-1.00 x 180 Vertex distance = 12 mm.
K: 43.50/44.50
Given the data above and referencing the Dyer nomogram, determine the following rigid contact lens parameters: base curve, optical zone size, peripheral curve size and surface power, over all diameter, and power .

The first step is to notice is if there is any residual astigmatism, or if it is all contained in the cornea. In this case, since the amount of astigmatism in the refraction equals that found in the cornea there is no residual astigmatism present. This means that a spherical rigid contact lens should completely correct this patient's ametropia. As we learned in Part 2 of this course, after transposing the Rx to minus cylinder form, we can now drop the cylinder and axis. And since the power is less than ± 4.00 diopters there is no need to compensate for vertex distance. Therefore *the combined power of the tear lens and contact lens* will need to equal -3.25D.

To come up with the correct the base curve, we first locate the flattest corneal meridian in the left hand column of the Dyer Chart on page 12. The flattest meridian in this case is 43.50. We then find the amount of existing corneal astigmatism along the top of the chart which in 1.00 D in this case. So we can see that the indicated base curve indicated is equal to 44.00 D.

For other lens parameters such as diameter, perpheral curves and thickness, we reference the charts on page 13. Finding 44.00 diopters in the left hand column of the "Dyer Chart For Other Lens Parameters" we notice that indicated diameter is 8.4 mm, with a 7.0 optical zone. If the lens containes only one peripheral curve its curvature would be 40.50 and contain a width of 0.2 mm. If the lens has two peripheral curves, the second would contain a curve of 36.50 D while a possible third curve would be the flattest at 30.00 D with a width of 0.3 mm.

The recommended base curve according to the Dyer chart is 44.00 D which is in fact 0.50 D steeper than 43.50, the flatter of the two corneal meridians. The approximate power of the tear lens, therefore will be equal to +0.50 D. What do we need to add to the +0.50 D in the tear to equal the desired combined power of -3.25? The answer is -3.75. Which means the power of the contact lens in this case will need to be -3.75D.

What about thickness? Lets reference the second chart on page 13. In this case the lens diameter is 8.4 and the power is -3.75 D. We find the power along the left hand column and the diameter across the top and it yields a center thickness of 0.12 mm. We will use 8.4 mm as the diameter since that is the closest diameter given on the chart.

Examples

Example 2:

Rx: +3.25 +1.75 x 010 Vertex distance = 10 mm
K: 44.75/46.50

Given the data above and referencing the Dyer nomogram, determine the following rigid contact lens parameters: base curve, optical zone size, peripheral curve size and surface power, over all diameter, and power .

All of the astigmatism is in the cornea, no residual astigmatism. Therefore a spherical rigid contact lens should correct this patient's ammetropia.

Transpose to minus cylinder form,
+5.00 -1.75 x 100

drop cylinder and axis,
+5.00

compensate for vertex distance.
+5.25 combined power of tear lens and contact lens at the corneal plane.

Base curve according to Dyer Chart is 45.50 which is 0.75 D steeper than K.

Power of tear lens therefore is approximately +0.75 D.

Since the combined power of the contact lens and tear lens at the corneal plane needs to equal +5.25 and we already have 0.75D in the tear, the power of the contact lens in this case need only be +4.50 D.

Other lens parameters according to the Dyer Chart:

Total diameter:	8.1 mm
Optical zone diameter:	6.7 mm
Peripheral curve:	42.00 D
Peripheral curve width:	0.20 mm
Thickness:	0.29 mm

Practice Exercises

Before completing the following practice exercises, we need to make the following observation for fitting rigid contact lenses according to the Dyer nomogram. That is the following: ***flatter base curves call for lenses with larger diameters, while steeper base curves call for lenses with smaller diameters.*** This would stand to reason since larger corneas are generally flatter while smaller corneas are steeper in curvature.

Using the data found in the following exercises, indicate the lens parameters by filling in the table on the opposite page. Refer to the charts on pages 12 and 13 as well as the vertex distance table found in part 2 of this course. The answers may be found on page 30.

#1) Spectacle Rx: -4.75 - 0.50 x 170 — Vertex distance = 12 mm
K: 45.50/46.00

#2) Spectacle Rx: -2.50 - 0.25 x 045 — Vertex distance = 8 mm
K: 43.00/43.25

#3) Spectacle Rx: +3.50 + 1.50 x 90 — Vertex distance = 10 mm
K: 46.75/48.25

#4) Spectacle Rx: +2.75 - 0.75 x 30 — Vertex distance = 12 mm
K: 44.37/45.12

#5) Spectacle Rx: -8.75 - 2.25 x 65 — Vertex distance = 8 mm
K: 41.25/43.50

#6) Spectacle Rx: -5.50 + 1.75 x 120 — Vertex distance = 10 mm
K: 43.00/44.75

#7) Spectacle Rx: +3.75 + 0.50 x 135 — Vertex distance = 12 mm
K: 47.75/48.25

Practice Exercises

?

Exercise #	1	2	3	4	5	6	7
Total Power at Corneal Plane (D) *	-4.50	-2.50	+5.00	+2.75	-8.25	3.75	-4.50
Base Curve (D)	45.75	43.25	47.5	45.00	42.25		
Power of Tear Lens (D)	+0.25	+.25	+.75	+.63	+1.00		
Power of Contact Lens (D)	-4.75	-2.75	+4.25	2.12	-9.25		
Overall Lens diameter (mm)	8.1	8.6	7.9	8.2	8.8		
Optical Zone (mm)	6.7	7.2	6.7	6.8	7.3		
Peripheral Curve (D)	42.00	39.5	43.5	41.5	38.5		
Center Thickness (mm) **	0.10	.14	.29	.21	.10		

* Round off power to nearest 0.25 diopter

** Use closest diameter indicated on thickness chart.

Fitting Methods

DYER CHART FOR BASE CURVE SELECTION

PRIMARY CURVE (Diopters)	BASE CURVE (Diopters) 0-0.50	0.62-1.00	1.25-2.00	2.25-3.00
40.00	40.25	40.50	40.75	41.00
40.25	40.50	40.75	41.00	41.25
40.50	40.75	41.00	41.25	41.50
40.75	41.00	41.25	41.50	41.75
41.00	41.25	41.50	41.75	42.00
41.25	41.50	41.75	42.00	42.25
41.50	41.75	42.00	42.25	42.50
41.75	42.00	42.25	42.50	42.75
42.00	42.25	42.50	42.75	43.00
42.25	42.50	42.75	43.00	43.25
42.50	42.75	43.00	43.25	43.50
42.75	43.00	43.25	43.50	43.75
43.00	43.25	43.50	43.75	44.00
43.25	43.50	43.75	44.00	44.25
43.50	43.75	44.00	44.25	44.50
43.75	44.00	44.25	44.50	44.75
44.00	44.25	44.50	44.75	45.00
44.25	44.50	44.75	45.00	45.25
44.50	44.75	45.00	45.25	45.50
44.75	45.00	45.25	45.50	45.75
45.00	45.25	45.50	45.75	46.00
45.25	45.50	45.75	46.00	46.25
45.50	45.75	46.00	46.25	46.50
45.75	46.00	46.25	46.50	46.75
46.00	46.25	46.50	46.75	47.00
46.25	46.50	46.75	47.00	47.25
46.50	46.75	47.00	47.25	47.50
46.75	47.00	47.25	47.50	47.75
47.00	47.25	47.50	47.75	48.00
47.25	47.50	47.75	48.00	48.25
47.50	47.75	48.00	48.25	48.50
47.75	48.00	48.25	48.50	48.75
48.00	48.25	48.50	48.75	49.00

Fitting Methods

Flatter BC = larger diameter lens

Steeper BC = smaller diam lens

DYER CHART FOR OTHER LENS PARAMETERS

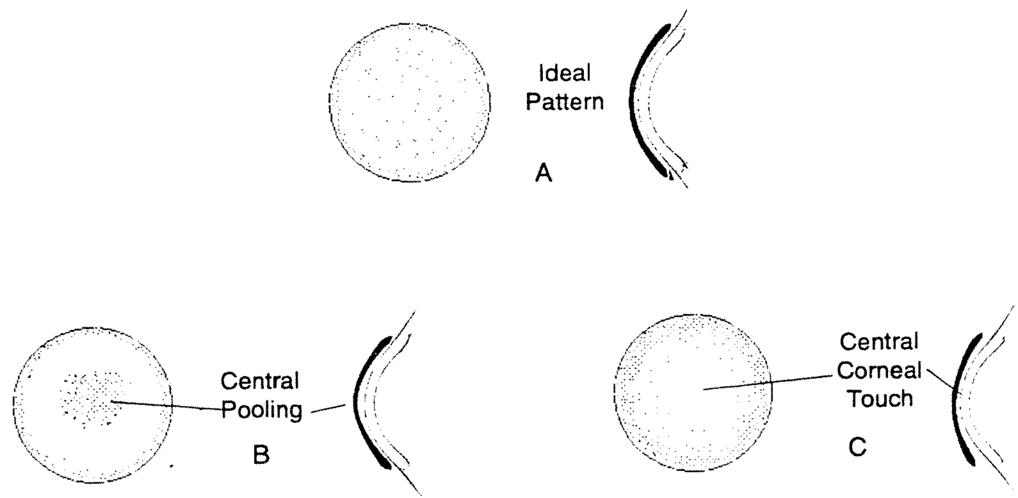
Base Curve (Diopters)	Diameter Of Lens	OZ	Peripheral Curves
40.00-40.25	9.2	7.6	36.50/.20, 32.50/.30, 27.50/.30
40.50-40.75	9.1	7.5	37.00/.20, 33.00/.30, 27.50/.30
41.00-41.25	9.0	7.4	37.50/.20, 33.50/.30, 27.050/.30
41.50–41.75	8.9	7.3	38.00/.20, 34.00/.30, 27.50/.30
42.00-42.25	8.8	7.3	38.50/.20, 34.50/.25, 27.50/.30
42.50-42.75	8.7	7.3	39.00/.20, 35.00/.20, 29.00/.30
43.00-43.25	8.6	7.2	39.50/.20, 35.50/.20, 29.00/.30
43.50-43.75	8.5	7.1	40.00/.20, 36.00/.20, 29.00/.30
44.00-44.25	8.4	7.0	40.50/.20, 36.50/.20, 30.00/.30
44.50-44.75	8.3	6.9	41.00/.20, 37.00/.20, 30.00/.30
45.00-45.25	8.2	6.8	41.50/.20, 37.50/.20, 31.00/.30
45.50-45.75	8.1	6.7	42.00/.20, 38.00/.20, 31.00/.30
46.00-46.25	8.0	6.7	42.50/.15, 38.50/.20, 33.00/.30
46.50-46.75	7.9	6.7	43.00/.10, 39.00/.20, 33.00/.30
47.00-47.25	7.9	6.7	43.50/.10, 39.50/.20, 33.00/.30
47.50-47.75	7.9	6.7	44.00/.10, 40.00/.20, 33.00/.30
48.00-48.25	7.9	6.7	44.50/.10, 40.50/.20, 33.00/.30
48.50-48.75	7.9	6.7	45.00/.10, 41.00/.20, 33.00/.30
49.00-49.25	7.8	6.6	45.50/.10, 41.50/.20, 35.00/.30
49.50-49.75	7.8	6.6	46.00/.10, 42.00/.20, 35.00/.30
50.00-50.25	7.8	6.6	46.50/.10, 42.50/.20, 35.00/.30

Recommended Lens Thicknesses

	Diameter (mm)				
Lens Powers (D)	9.0	8.5	8.0	7.5	7.0
			Minus Power		
Plano to -0.62	0.18	0.17	0.16	0.15	0.14
-0.75 to -1.37	0.17	0.16	0.15	0.14	0.13
-1.50 to -2.12	0.16	0.15	0.14	0.13	0.12
-2.25 to -2.87	0.15	0.14	0.13	0.12	0.11
-3.00 to -3.62	0.14	0.13	0.12	0.11	0.10
-3.75 to -4.37	0.13	0.12	0.11	0.10	0.10
-4.50 to -5.12	0.12	0.11	0.10	0.10	0.10
-5.25 to -5.87	0.11	0.10	0.10	0.10	0.10
-6.00 & over	0.10	0.10	0.10	0.10	0.1
			Plus Power		
+0.12 to + 1.75	0.20	0.18	0.17	0.16	0.15
+0.87 to +1.50	0.22	0.20	0.19	0.18	0.16
+1.62 to + 2.25	0.24	0.22	0.21	0.20	0.18
+2.37 to +3.00	0.26	0.24	0.23	0.21	0.20
+3.12 to +3.75	0.28	0.26	0.25	0.23	0.22
+3.87 to +4.50	0.30	0.28	0.27	0.25	0.24
+4.62 to + 5.25	0.32	0.30	0.29	0.27	0.25

Rigid Lens Evaluation

This page will begin the second half of Part 3. The taped discussion of this material can be found on Tape 4, side 2. A discussion of fitting goals for rigid and soft lenses and lens verification techniques will supplement the workbook material.



Flourescein Patterns:

Flourescein is a common dye or stain which can be used to help analyze the fit of rigid lenses. When it mixes with the tear film it will glow or flourescein in the presence of ultraviolet light or cobalt blue light. It allows the fitter to examine the shape and flow of the tear layer between the back surface of the lens and the front surface of the cornea. It is available in solution form or impregnated in paper strips.

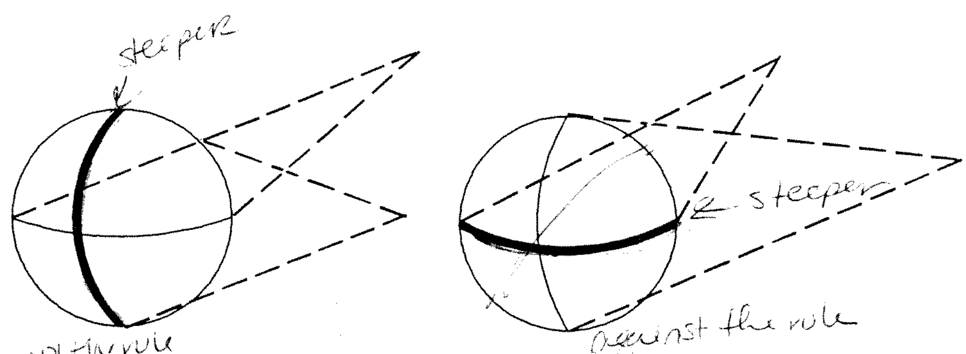
Figure A above indicates an ideal flourescein pattern. The even distribution of flourescein indicates good support of the lens by the cornea, and an even flow of tears under the lens. The flatter peripheral curve results in the added thickness of film around the lens periphery.

Figure B shows a lens which is fit too steep with central stagnation of dye. Intermediate touch is the result of a relative lack of flourescein just outside the region of pooling. The thin peripheral curve indicates a diminished lift of the lens edge.

Figure C indicates a flat lens, showing central touch and diminished dye. There is a greater amount of flourescein found under the peripheral rim of the lens.

Astigmatism

OBLIQUE ASTIG - ASTIG NOT AT 180 OR 90 OR W/IN 5° OF EITHER

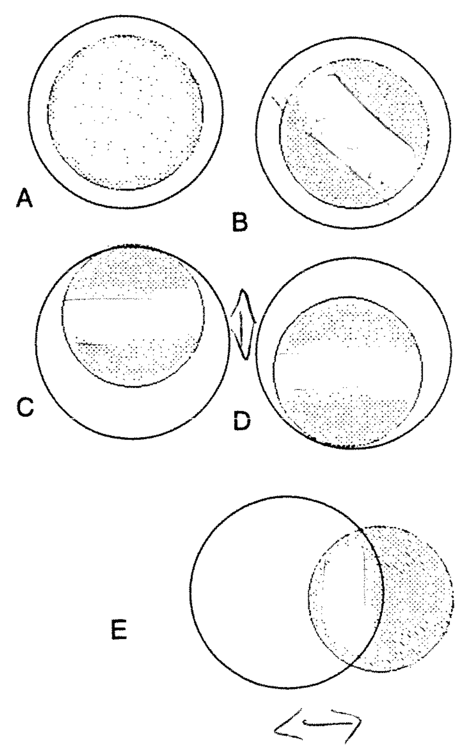


A B

Figure A above illustrates *with the rule* corneal astigmatism. In this case the verticle meridian has the steeper curve.

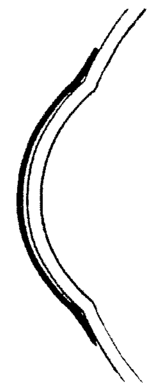
Figure B shows corneal astigmatism *against the rule* where the horizontal meridian has the steeper curvture.

Figure A to the right again shows an ideal fluorescein pattern where the dye is evenly distributed. In figure B the oblique astigmatism shows less dye along the obliquely oriented flatter meridian. Pooling occurs in the other steeper portions of the cornea covered by the \contact lens. Figures C and D represent with-the-rule astigmatism, where the flatter corneal meridian is horizontal. After a blink, the lens can be pulled up high, fall low. The lens will tend to move to either side following the steeper meridian. Figure E shows the less common against-the-rule astigmatism. Here, as the lens moves to follow the steeper meridian, it is pushed almost all the way off to one side.



Soft Lens Fitting

General Characteristics:



Soft contact lenses are actually semi-scleral or corneoscleral lenses that fit over the cornea and sclera simultaneously. Due to the hydrated plastic material from which they are made they are inherently gas permeable. The cornea can breath primarily through the lens matrix and to a lesser degree by the tear pump action which is created as the lens flexes during blinks. Soft lenses move less on the eye during the blink cycle than to rigid lenses. However the amount of movement will increase with thicker lenses. In general they are more comfortable than hard lenses for most patients provided that there is no lens compression along the limbal area since the lens is continually in contact with this area.

Fitting Goals:

The lens should not be fit too tight. A tight fit could result in pain and redness within a just a few minutes since it causes the limbal vessels to become compressed due to tissue edema at the edge of the lens. In addition, the lens should center well allowing the limbus to be completely covered at all times during blinking. When spin cast lenses are used, they are generally fit about 2 mm larger than the HVID, horizontal visible iris diameter.

The lens should be left on the eye for at least 15 minutes before making a final decision regarding the parameters. This allows the lens to conform to the pH, temperature and osmolarity of the eye. Also, a small bubble or collection of tears at the apex of a newly inserted lens can temporarily effect its curvature.

Kerartometry, although not as important as with hard lenses, should nonetheless be taken in all cases. It provides a baseline measurement of corneal curvature which may need to be referenced in future follow up visits. Also, keratometry will provide at least a rough idea as to whether a flatter or steeper lens should be tried first. The base curves available will vary with the manufacturer. Generally soft lenses are available in three base curves which will be suitable for the majority of corneas due to the flexible nature of the material. Base curves may be indicated in millimeters of radius of curvature or simply as median, flat, and steep, or as Vault I, Vault II, and Vault III.

Spherical Equivalent:

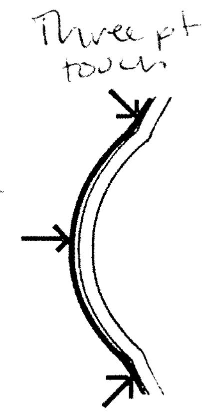
Spherical soft lenses are often fit even when a relatively low amount of astigmatism is manifest. When presented with a spectacle prescription of say, -3.50 -0.50 x 180, a spherical soft contact lens with a power of -3.75 could be indicated. This power is known as the *spherical equivalent* and is derived by algebraically adding half the cylinder power to the sphere.

1/2 cyl + sphere = spher equiv.

Use when less than 1D of astigmatism.

Soft Lens Fitting

Characteristics Of A Good-Fitting Lens:



A soft lens that is fitting well will demonstrate three point touch. The lens should rest lightly on the apex and the peripheral areas of the cornea. All soft lenses should be fit to obtain this goal regardless of manufacturer, power or size.

Another goal is good centration. After blinking the rim of the lens should not show more on one side of the cornea than the other.

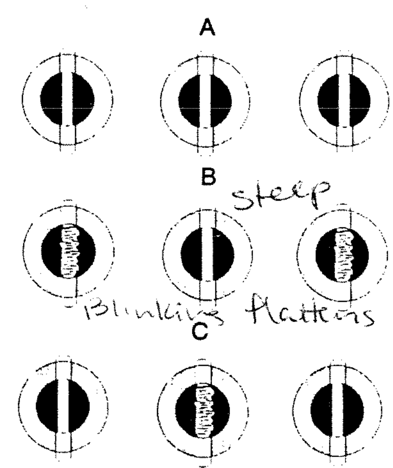
There needs to be adequate movement. A standard thickness should move about 0.5 to 1.0 mm while gazing upward after a blink. Thinner lenses are generally fit tighter and less than 0.5 mm of movement is acceptable due to the greater oxygen permeablilty of the thinner lens.

Stable vision should be achieved. Visual acuity should be as sharp as possible and remain equally clear before and immediately after the blink.

Crisp retinoscopic reflex. A soft lens is fitting well when the retinscope streak or spot is as sharp and crisp before and after blinking as it would be if no lens were in place.

Clear, undistorted keratometry mires. These mires should remain clear and undistorted both before and after a blink.

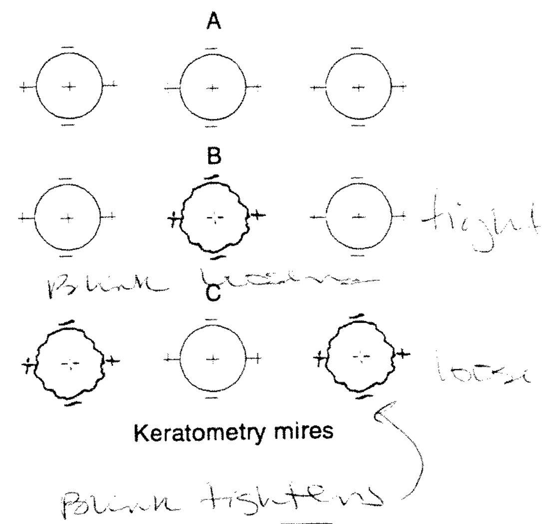
The retinscopic reflex shown in figure A illustrates a good fit. It is as sharp and crisp as if no lenses were being worn both before and after blinking.
Figure B illustrates a steep fitting lens where the streak spreads centrally while in the rest position. It will clear after a blink due to the flattening out of the apical vault by the action of the upper lid.
Figure C shows shows a flat fitting lens which is blurry immediately after the blink. It may ride low before the blink causing distorted



Retinoscope reflexes

Soft Lens Fitting

Keratometry mires may also be used to help evaluate the fit of soft contact lenses. When the lenses are fitting properly, the mires of the keratometer are not distorted either before or after the blink as demonstrated in figure A. Figure B iillustrates an unacceptably steep fit where the mires are distorted before the blink, clear up temporarily immediately after the blink, then become distroted agian as the lens resumes its original shape, vaulting the corneal apex. Figure C demonstrates a loose fit where the mires are initially clear, distorted immediately after the blink, then clear again.



Keratometry mires

Rigid Lens Verification

Tolerances
Diameter = .05mm
BC .025 mm
Power = .25D
astig .12D

After receiving rigid lenses from the laboratory, the following parameters should be inspected for accuracy.

- Diameter
- Surface Quality and Edges
- Base Curve
- Power
- Thickness
- Blend and Transition Zones

Diameter: The lens diameter can be verified with a measuring hand maginifier, a diameter gauge, or one of the various types of projector inspection devices. Tolerance is within 0.05 mm. .010

Surface Quality and Edges: Can be assessed utilizing a measuring magnifier, projector incpection device, or through the use of the slit lamp.

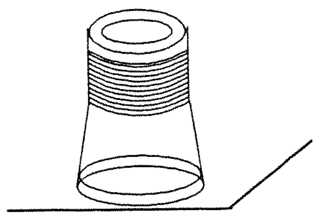
Base Curve: Most often measured utilizing a radiuscope. Base curves can also be measured using a keratometer with a special holder which allows the contact lens to be held horizontally while the keratometer remains in its normal position. Such a holder is called a *Con-ta-chek.* The base curve should be accurate to within 0.025 mm of specifications. BC

Power: Back vertex power is measured with a lensometer. Should be within 0.25 D of power specified with less than 0.12D of uncalled for astigmatism.

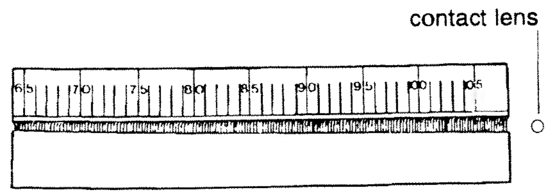
Thickness: Measured with a thickness gauge.

Blend & Transition Zones: May be examined through the use of a hand magnifier, projectior inspection device, or slit lamp.

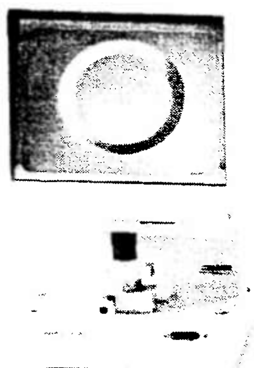
Rigid Lens Verification



Measuring Hand Magnifier

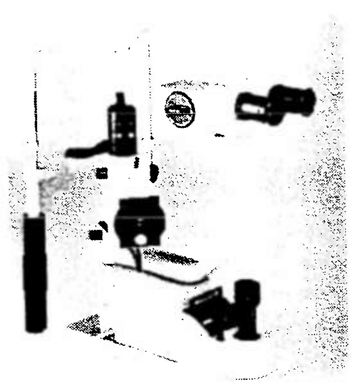


Diameter Gauge



Projector Inspection Device

Radiuscope



Slit Lamp

Thickness gauge

Soft Lens Verification

The following paramaters of soft contact lenses may be verified:

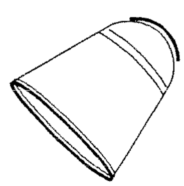
- Diameter
- Base Curve
- Power

The methods which can be utilized for verification of soft lenses cannot be relied upon for complete accuracy. As a result there is a risk of premature rejection due to inaccurate or invalid test results. Therefore one method of verification is accomplished by simply inserting the lenses and inspecting them carefully once they are in the eyes. Any problems may be delt with at this point.

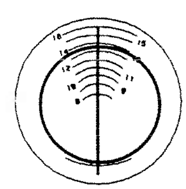
Diameter: May be measured with a hand magnifier which allows the soft lens to contour intself to the magnifier.

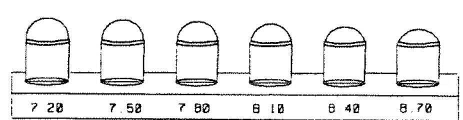
Base Curve: Can be measured on templates of known radii of curvature. Can be measured on a Soft Lens Analyzer which can also be used to measure diameter center thickness, and provide close surface and edge inspection.

Power: Can be measured using a lensometer. A water cell may also be used to measure the power of a soft lens in the hydrated state. The soft lens is floated in normal saline and measured in a lensometer. The lensometer reading is multiplied by a factor of four. Not a reliable method since the power can vary with the thickness of the lens which varies from high plus to low minus.

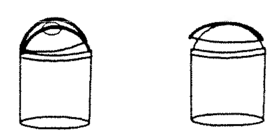


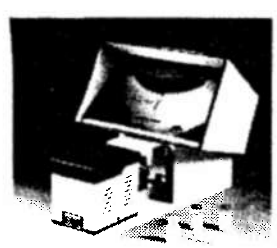
Monocular Magnifier



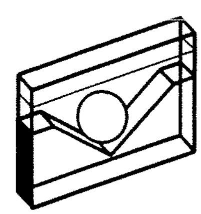


Plastic Templates





Soft Lens Analyzer



Water Cell

Practice Test

The practice test will be reviewed on Tape 5, side 1. Before taking this test be sure you have understood and absorbed the material as thoroughly as possible. Listen to the taped review only after having completed the practice test.

___1. The power of a contact lens is generally specified:

a. in front vertex power
b. in back vertex power
c. in keratometry readings
d. while the lens is on the eye

___2. It is possible to assess the quality of the peripheral curves of a rigid contact lens through the use of the:

a. shadowgraph -
b. burton light
c. keratometer
d. profile analyzer

___3. A flourescein pattern with a rigid contact lens in place shows a narrow band horizontally, with a concentration of flourescein under the lens both inferiorly and superiorly. The type of astigmatism represented by this pattern is:

a. with the rule astigmatism
c. against the rule astigmatism
c. oblique astigmatism
d. residual astigmatism

___4. The lens diameter, optic zone width, and peripheral curve width may be verified simultaneously through the use of:

a. radiuscope
b. measuring magnifier
c. profile analyzer
d. keratometer

___5. Analysis or evaluation of which of the following will help determine the best contact lens diameter

1. trial lenses
2. HVID
3. Dyer Nomogram
4. corneal topography

a. 1, 2, & 3
b. 1, 2, & 4
c. 2, 3, & 4
d. 1, 2, 3, & 4

Practice Test

___6. Your patient is wearing a rigid contact lens in her right eye. It has a power Of +3.00 D and a base curve of 43.25. If the doctor refracts -0.50 sphere over this lens and a new lens is to be ordered with a base curve of 43.00, what will the new power need to be?

a. +3.75 D
b. +3.25 D
c. +3.00 D
d. +2.75 D

___7. Using the Dyer Nomogram as a guide, which of the following would not represent a realistic K reading/lens diameter relationship.

Steeper smaller
flatter larger

a. 43.25/44.25/lens diameter: 8.6
b. 48.25/49.25/lens diameter: 7.7
c. 40.00/41.00/lens diameter: 9.2
d. 40.00/41.00/lens diameter: 8.2

___8. Rx: -3.25 - 0.75 x 180
K's 43.50 at 180/44.25 at 90

Which of the following set of lens parameters would most simulate a RGP interpalpebral fitting? smaller & steeper than K

a.	43.00	-2.75	8.6
b.	44.00	-3.75	8.6
c.	44.00	-3.75	9.6
d.	43.00	-2.75	8.6

___9. Rx: -2.00 - 0.50 x 180
K's 42.50 at 180/43.50 at 90

Which of the following set of lens parameters would most simulate a lid attachment RGP fitting? larger flatter

a.	43.50	-3.00	9.6
b.	42.00	-1.50	9.6
c.	43.00	-2.50	8.6
d.	43.50	-3.00	8.3

Practice Test

___10. Which of the following is not generally used in the fitting of contact lenses?

a. slit lamp
b. keratometer
c. lensometer
d. trial lenses

___11. The first thing to do before using a keratometer is:

a. focus the mires
b. rotate the drum
c. focus the eyepiece
d. lock the instrument into position

___12. Rigid lenses may be inspected with which of the instruments listed?

a. lensometer
b. radiuscope
c. diameter gauge
d. all of the above

___13. Dynamic fluorescein pattern can be observed:

a. immediately after the patient has blinked
b. when the patient is directing the gaze in a straight ahead position.
c. after the lens has returned to the normal position
d. none of the above

___14. The optical zone of a contact lens may be measured with:

a. a measuring magnifier
b. a radiuscope
c. a conversion table
d. none of the above

___15. Which of the following cannot be used as a lens inspection device?

a. diameter gauge
b. distometer
c. lensometer
d. radiuscope

Practice Test

___16. Contact lens diameter may be most accurately measured using a:

a. millimeter ruler
b. measuring magnifier
c. radiuscope
d. lensometer

___17. A dynamic flourescein pattern is best illuminated by:

a. indirectg light
b. cobalt light
c. penlight
d. fixation light

___18. When a keratometer is used to help evaluate the fit of a soft contact lens, distorted mires would most often indicate that the lens is:

a. too flat
b. too steep
c. an ideal fit
d. just slightly flat

___19. A radiuscope is designed to:

1. inspect surface quality
2. measure radius of curvature
3. measure lens power
4. measure lens diameter

a. 1 & 3
b. 1 & 2
c. 2 & 3
d. 2 & 4

Practice Test

___20. The quality of the surface of a rigid contact lens may be inspected utilizing:

1. slit lamp
2. lensometer lens power
3. measuring magnifier
4. burton lamp - Fluorescein

a. 1 & 3
b. 1, 3, & 4
c. 2, 3, & 4
d. 1 only

___21. The health of the cornea in an RGP fitting is dependent upon which of the following?

1. gas permeability of the lens
2. size of the palpebral fissure
3. overall corneal diameter
4. lens/cornea relationship and movement

a. 1 & 4
b. 1 only
c. 2 & 3
d. 1, 2, 3, & 4

___22. The primary source of oxygen for the cornea is:

a. basal membrane
b. endothelium
c. tears
d. atmosphere

___23. After being placed on the patient's cornea, it is observed that a soft contact lens is demonstrating "edge lift". This can be corrected by:

a. decreasing the diameter
b. shortening the radius of the base curve
c. lengthening the radius of the base curve
d. altering the edge design

Practice Test

___24. The base curve of a rigid contact lens was ordered at 7.85 mm and was received measuring 7.95 mm. This lens is ______________than ordered.

a. 1.00 D steeper
b. 0.50 D flatter
c. 1.00 D flatter
d. 0.50 D flatter

___25. Concentric circles reflected off a patient's cornea can be evaluated using a:

a. lensometer
b. con-ta-chek - Holds lens to keratometer
c. placido disk
d. topogometer

___26. When a rigid contact lens shows apical touch, this would indicate a:

a. a steep fit
b. a flat fit
c. an astigmatic fit
d. a perfect fit

___27. A rigid lens showing a band-shaped area of touch on the flattest corneal meridian indicates:

a. an astigmatic fit
b. a flat fit
c. an alignment fit
d. a steep fit

___28. Which of the following is not an advantage of rigid palpebral lenses?

a. eye movement is free from lid irritation
b. they are easy to remove
c. they result in minimal spectacle blur
d. they can provide excellent tear exchange

Practice Test

___29. Which of the following is true about rigid, high-riding lid attachment lenses?

1. they can be useful when poor centration isnoted with smaller lenses
2. annoying flare can be minimized due to the larger optic zone
3. they are an excellent design for small, steep corneas
4. spherical lenses can generally correct for up to 3.00 to 4.00 D of corneal astigmatism.

a. 1, 2, & 4
b. 1, 3, & 4
c. 2, 3, & 4
d. 1 & 3

___30. A well fit soft contact lens will demonstrate:

a. three point touch
b. good centration
c. adequate movement
d. all of the above

___31. In evaluating the fit of a pair of soft contact lenses with a keratometer, it is observed that the mires are blurry when the lenses are in place. However, after each blink the mires become clear temporarily, then turn blurry again. This pattern indicates:

a. an excellent fit
b. a loose fitting lens
c. a tight fitting lens
d. three point touch

___32. An "ideal" flourescein pattern for a spherical lens on a spherical cornea would show:

a. intermediate zone touch and a thin peripheral rim
b. an even distribution of flourescein with added thickness under the peripheral curves
c. diminished dye in the center with accentuated flourescein under the peripheral curves
d. none of the above

Practice Test

___33. Your patient is wearing a rigid contact lens with a base curve of 42.50 and a power of -3.25 D. The doctor over refracts -0.75 over this lens. If the final lens to be ordered will have a base curve of 42.25, what will its power have to be?

a. -3.25
b. -3.50
c. -3.75
d. -4.00

___34. In evaluating the fit of a soft contact lens with either keratometry mires or a retinoscopic reflex, distortion immediately following each blink is detected. This would be caused by:

a. a properly fitting lens
b. a tight fitting lens
c. a loose fitting lens
d. a steep fitting lens

Answers to Practice Exercises on Pages 10-11.

Exercise #	1	2	3	4	5	6	7
Total Power at Corneal Plane (D)	-4.50	-2.50	+5.25	+2.75	-8.25	-3.75	+4.50
Base Curve (D)	45.75	43.25	47.50	45.00	42.25	43.75	48.00
Power of Tear Lens (D)	+0.25	+0.25	+0.75	+0.63	+1.00	+0.75	+0.25
Power of Contact Lens (D)	-4.75	-2.75	+4.50	+2.12	-9.25	-4.50	+4.25
Overall Lens diameter (mm)	8.1	8.6	7.9	8.2	8.8	8.5	7.9
Optical Zone (mm)	6.7	7.2	6.7	6.8	7.3	7.1	6.7
Peripheral Curve (D)	42.00	39.50	44.00	41.50	38.50	40.00	44.50
Center Thickness (mm)	0.10	0.14	0.29	0.21	0.10	0.11	0.29

Notes

1. B
2. A
3. A
4. B
5. D
6. D
7. D
8. B
9. B
10. B
11. C
12. A
13. A
14. A
15. B
16. B
17. B
18. B
19. B
20. A
21. A
22. C
23. B
24. B
25. C
26. B
27. A
28. B
29. A
30. D
31. C
32. B
33. C
34. C

Notes

Notes

Notes