NCLE A/C Domain II:

Vision Expo 25

Design, Fit, & Dispense Standard & Specialty Contact Lenses

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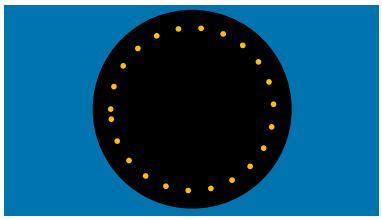

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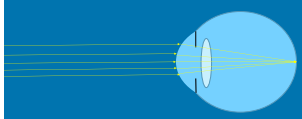
REVIEW from NCLE

4

EMMETROPIA When rays are focused Exactly on the Retina

(without accommodation)



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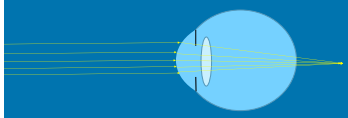
How does the anatomy of the eye contribute to Refractive error?

AMETROPIA: When rays are NOT focused Exactly on the Retina

no accomodation

6

Hyperopia When rays are focused BEHIND the Retina



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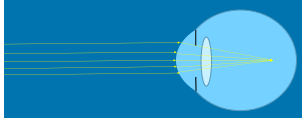
Myopia When rays are focused IN FRONT on the Retina



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What factors can lead to myopia?

Refractive power too strong

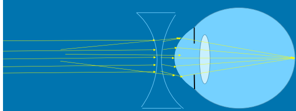
OR

Axial Length Too LONG

9

Myopia (NEAR SIGHTED)

Corrected with MINUS lens / DIVERGING lens to allow light to focus on Retina



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Manufacture of lenses

GP lenses (GP)

- Lathe cut and polished

Soft Contact Lenses (SCL)

- Initially spin cast
- Can be Lathe Cut and Polished
- Most = Injection molding (mass produced)

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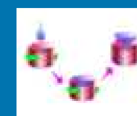
Spin Cast

Method 1

1. Drop Lens Material in spinning mold
1. Front curve will be determined by the mold
1. Base Curve determined by SPEED/force of spinning
1. Cure lens (UV)



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Injection Molding

Method 2

Most popular for SCL!

1. mold of front and back surfaces
1. Inject polymer
1. Cure
1. Remove from mold

13

https://www.youtube.com/watch?v=eoaTl8Q0PQc
https://www.youtube.com/watch?v=7fbgg1viwvg
https://www.youtube.com/watch?v=Wzgi1rCrovk

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Lathe cut and polish

Method 3

ALL GP *(and some specialty SCL)*

1. "button" of CL material
1. Lathe cut back surface (and polish)
   - CPC
   - Peripheral Curves
2. Lathe Front surface (and polish)
   - Power (BVP)
   - Thickness
   - Multifocal or Toric Front surface
3. polish and smooth edge

15

https://www.google.com/search?client=firefox-b-1-d&q=contact+lens+how+its+mad#fpstate=ive&vld=cid:0ad62f61,vid:DZJpPdulc4w,st:50

16

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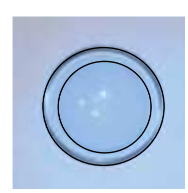

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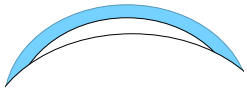

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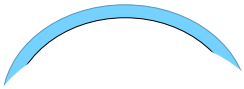

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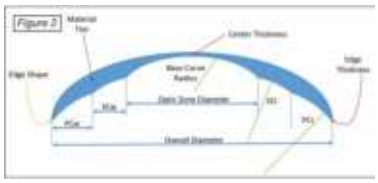

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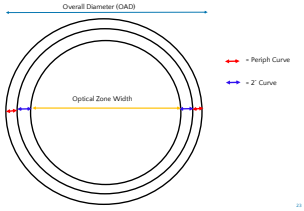

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How do you measure these parameters

OAD (Overall Diameter)	CPC (Central Posterior Curve, or Base Curve)	Lens power
• Diameter Gauge • Magnifier	• Radiuscope	• Lensometer

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Also Important to verify

Center thickness (CT)	Posterior/secondary/intermediate curves AND blends	Edge Design
Calipers Thickness Gauge	• Magnifier	• Magnifier

25

VERY BASIC REVIEW

SOFT VS Gas Permeable (RIGID)

Note: some rec using the term (Gas Perm), rather than RIGID
Note: "HARD" lenses trad = PMMA...

Which is better Soft (SCL) or Gas Perm (RGP)?

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GP lenses (GP)

- Pros
  - Potentially better vision
  - Better safety/fewer complications
    - More O2 to cornea
    - Less water to absorbtion (1%)
  - Durability
  - Cost over time
  - Potentially better for specialty (mf, toric, high powers)

Soft Contact Lenses (SCL)

- Pros
  - Easy Initial adaptation
  - Easily obtainable/ubiquitous
  - Easily replaceable
  - Standardized
  - Avail in colored lenses
  - Less likely to dislodge (sports, etc)

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GP lenses (GP)

- Cons
  - Initial adaptation
  - Debris under lens/discomfort
  - Not indicated for dusty dirty environ
  - Potential to dislodge
  - Not great for part time/occasional wear ("weekend warriors")
  - not indicated for contact sports

Soft Contact Lenses (SCL)

- Cons
  - More complications
    - Potentially less O2
    - Attract more deposits
  - Dryness discomfort at end of day
  - More likely to purchase without proper care
  - Limited parameters (mass produced brands)
  - Higher long term cost, esp with increased replacement

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GP lenses (GP)

- Smaller in Diameter/Width (9.0-10.0mm)
- Move more with blink
- Custom fit (every one is lathe cut)

Soft Contact Lenses (SCL)

- Larger in Diam/Width (13.8 to 14.5)
- Often Less movement blink (0.5mm)
- More "commercial" or "off the rack"

30

SOFT CL FITTING

1. BVP (BACK VERTEX POWER)
2. BC/OAD
   - Base Curve (in mm)
   - OAD is Overall Diameter (in mm)

31

SOFT CL FITTING

1) Choose BVP

Is cyl < 0.50 D? Generally Spherical SCL
Is cyl ≥ 0.75 D? Generally toric SCL

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SOFT CL FITTING

1) Choose BVP

Eyeglass Rx
-4.00 sph = spherical SCL
-4.00 -0.50 x 180 = spherical SCL
-4.00 -1.25 x 180 = Toric SCL

34

SOFT CL FITTING

1) Choose BVP

IF spherical SCL

1. find SPHERICAL EQUIVALENT
2. Vertex if > +/- 4.00 Dioters

35

SOFT CL FITTING

1) Choose BVP

Eyeglass Rx		Best SCL BVP
-1.00 sph	=	-1.00
-2.00 sph	=	-2.00
-4.25	=	-4.00
-6.50	=	-6.00
+4.25	=	+4.50
+6.00	=	+6.50

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SOFT CL FITTING

1) Choose BVP

Eyeglass Rx		Best SCL BVP
-0.75 -0.50 x 180	=	-1.00
-1.75 -0.50 x 180	=	-2.00
-4.00 -0.50 x 180	=	-4.00
-6.25 -0.50 x 180	=	-6.00
+4.50 -0.50 x 180	=	+4.50
+6.25 -0.50 x 180	=	+6.50

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SOFT CL FITTING

Note that ALL of the above examples are in MINUS CYL....make sure when finding Spherical Equivalent, that you are calculating correctly!!

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SOFT CL FITTING

1) Choose BVP
IF Spec Rx has cyl of 0.75 or higher

1. Determine powers in EACH meridian
2. VERTEX EACH SEPARATELY > +/- 4.00 D
3. Put BACK Sph cyl x Axis format
4. Use this power to select power for contact lens

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SOFT CL FITTING

1) Choose BVP
IF Spec Rx has cyl of 0.75 or higher USE TORIC lens

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SOFT CL FITTING

1) Choose BVP
TORIC lens

1. Determine powers in EACH meridian
2. VERTEX EACH SEPARATELY > +/- 4.00 D
3. Put BACK Sph cyl x Axis format
4. Use this power to select power for contact lens

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SOFT CL FITTING

1) Choose BVP
TORIC lens
NOTE:

- Most Toric SCL start with -0.75 cyl and go up in 0.50 increments
- Most toric lenses are made with axis in 10 degree increments

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SOFT CL FITTING

1) BVP toric Lens

Given Rx of -1.00 -1.75 x 180
Power at 180 = -1.75
power at 90 = -2.75

NO over 4.00, so no vertex

Soft Toric CL = -1.00 -1.75 x 180

43

SOFT CL FITTING
BVP toric Lens

Given Rx of -4.25 -2.25 x 180
Power at 180 = -4.25
power at 90 = -6.50

Vertex power at 180 = -4.00
power at 90 = -6.00

Vertexed rx for CL power = -4.00 -2.00 x 180

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SOFT CL FITTING
BVP toric Lens

Vertexed rx for CL power = -4.00 -2.00 x 180

UH OH... toric lenses don't come in -2.00 cyl

Which Soft SCL to choose?

-1.75 cyl or -2.25 cyl

45

SOFT CL FITTING
BVP toric Lens

Vertexed rx for CL power = -4.00 -2.00 x 180

GENERALLY choose LOWER cyl

Best initial Toric SCL to choose is:
-4.00 -1.75 x 180

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SOFT CL FITTING
BVP toric Lens

So to recap:

Given Spec Rx of -4.25 -2.25 x 180

Best initial Toric SCL to choose is:
-4.00 -1.75 x 180

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SOFT CL FITTING

Choose correct BC/Diam

Diam
- should be 2-2.5mm more than HVID
- Avg HVID 11.8-12.3

BC
- FOLLOW FITTING GUIDE from Manufacturer

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SOFT CL FITTING

Most SCL are mass produced.

most = 1 BC/Diam combination (Sometimes 2?)

IF one BC/DIAm = poor fit, choose another lens

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Rigid Gas Permeable lenses are NOT like SCL

If I want to fit a pt with a -2.00 Sphere Rx

if GP….can have an BVP of

-1.75….
or -2.00
or -2.25

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WHY????

Because the Rigid shape allows for a formation of a TEAR lens under the Contact….

That tear lens can have refractive power

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SOFT CL = NO Add'l tear lens

GP = Add'l Tear lens….

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"power" made by Soft CL is just the Contact lens power…….

But when fitting GP lenses, you must take into account the CONTACT LENS AND TEAR LENS

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Can use a formula:

Total Power = CL + Tear Lens

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First have to figure out the "power" of the Tear Lens….

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Tear Lens calculations

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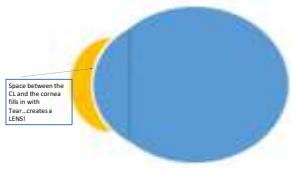

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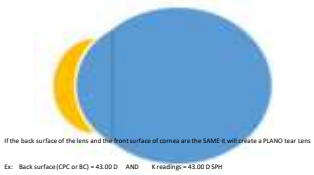

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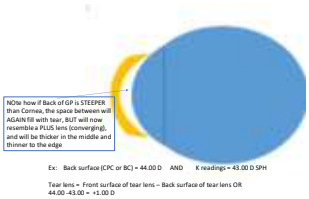

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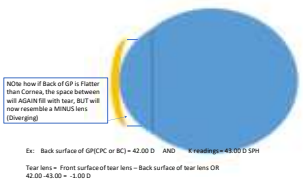

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SAM/FAP

- Since we will be inducing a tear lens when we fit a GP either "FLATTER than K" or "STEEPER than K" this will affect what CL power (BVP, or Back Vertex Power) we use.
  - (Note: "K" refers to the flattest of any meridian on the cornea)

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SAM/FAP

- For example, let's say you have a patient where you decide to fit a GP sphere on their eye that is 0.50 FTK
  - Given:
    - Rx -3.00 Sph
    - K = 43.00 D
  - A lens fit Flatter than K would be ordered at 42.50 (42.50 is 0.50D flatter than 43.00)
  - This, as we demonstrated before, would result in a Tear lens that was approx. -0.50 D in power….this is regardless of the Contact lens power.
  - SO if the Patient NEEDS a -2.00 sph to see clearly, and WE'VE ALREADY added a -0.50 by fitting the lens flatter than K, then we no longer need a -2.00 CL power.

65

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66

SAM/FAP

- For example, let's say you have a patient where you decide to fit a GP sphere on their eye that is 0.50 FTK
  - Given:
    - Rx -3.00 Sph
    - K = 43.00 D
  - Since there is ALREADY a -0.50 there with the tear lens, and patient needs a -2.00 total, then what Contact lens power would we use to get a -2.00 total in front of the patient's eye?
    - Meaning adding BOTH the CL and tear lens will result in the power we give to the pt.
  - IN this case if we order a -1.50 lens the pt will see well.
    - They will have -1.50 for the CL power AND
    - -0.50 for the tear power
    - For a total of -2.00…which is what the Dr prescribed

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SAM/FAP

- So it is important that in GP (unlike soft lenses) we need to take into account the TEAR lens that we've created when determine the power of the GP lens (BVP)
  - Recall there is no Tear lens of consequence in a Soft lens, as they "Drape" over the cornea, and essentially match the shape, where GPs will essentially maintain their shape.

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SAM/FAP

- IF we fit a GP that is STEEPER than the patient's cornea, it will result in PLUS tear Lens
- IF we fit a GP that is FLATTER than a patient's cornea, it will result in a MINUS tear lens

In either case we will have to adjust the power of the lens we order to account for this tear lens we've created:

- For any lens we fit **STEEPER** than the cornea, we will have to adjust the GP contact lens power by **ADDING MINUS** power (by the amount the lens is steeper than the cornea)
- For any Lens we fit **FLATTER** than the cornea, we will have to adjust the GP CL power by **ADDING PLUS** power (by the same amount that the lens is flatter than the cornea.

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SAM/FAP

STEEPER ADD MINUS
FLATTER ADD PLUS

Or, SAM FAP

SO any time we fit a lens Steeper than K, or adjust an existing lens to become Steeper, add MINUS power to the CL you order

And similarly add PLUS to any lens you fit or adjust to become Flatter

70

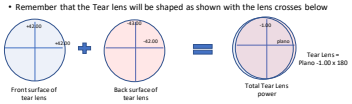
Correcting Astigmatism with a GP sphere lens

- So now we reach a neat aspect of GP SPHERICAL lenses.
- IF the cornea upon which we place a SPHERICAL GP lens is Toric (different curvatures in different meridians) we will actually create a TEAR lens that has Astigmatism correction.
- Let's look at an example

71

Correcting Astigmatism with a GP sphere lens

- Given:
  - GP lens with a CPC (central posterior Curve) of 42.00D
  - OD K 42.00 @ 180/ 43.00 @ 90
  - Remember that the Tear lens will be shaped as shown with the lens crosses below



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- https://gpli.info/lens-calculator/

73

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Tear Lens

• So if the amount of corneal matches Toricity (Δ K) matches the amount of cylinder in the Refraction/Rx, then the tear lens will create enough astigmatism to correct the patient's astigmatism need

GP SPHERICAL LENS (no cyl in GP lens) will create cylinder in Tear Lens

75

Tear Lens

GP SPHERICAL LENS (no cyl in GP lens) will create cylinder in Tear Lens that is equivalent to the Δ K

If Δ K = Rx cylinder

GP lens should correct astig

(not GP lens, but tear lens UNDER the GP)

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Tear Lens

GP SPHERICAL LENS (no cyl in GP lens) will create cylinder in Tear Lens that is equivalent to the Δ K

If Δ K ≠ Rx cylinder

GP (and tear lens) will NOT correct astigmatism

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What happens if

Δ K ≠ Rx cyl !?!?!

Generally comes from the crystalline lens

Sometimes called
"lenticular" astigmatism
Or
"Internal" astigmatism

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What happens if

Δ K ≠ Rx cyl !?!?!

"lenticular" astigmatism
Or
"Internal" astigmatism

Because it is from somewhere OTHER than Cornea

79

What happens if

Δ K ≠ Rx cyl !?!?!

Recall that a GP spherical Lens on a Cornea
Will create a tear lens with cylinder correction

Equal to Δ K

IN amount and direction

80

What happens if

Δ K ≠ Rx cyl !?!?!

IF a patient has the following :
K = 43.00 @ 180/ 43.00 @ 090 (Δ K = 0)

If Rx is
-1.00 -1.50 x 180

How much astigmatism is from cornea? NONE
How much astigmatism is from internal/lens? ALL OF IT

81

What happens if

Δ K ≠ Rx cyl !?!?!

IF a patient has the following :
K = 43.00 @ 180/ 43.00 @ 090 (Δ K = 0)

If Rx is
-1.00 -1.50 x 180

How much astigmatism is from cornea? NONE
How much astigmatism is from internal/lens? ALL OF IT

82

What happens if

Δ K ≠ Rx cyl !?!?!

ANY Cyl in the Prescription that is NOT corrected by the Tear lens from a GP sph

IN addition to "internal" or "lenticular" astig

We often refer to this as **RESIDUAL ASTIGMATISM**

83

So when

Δ K ≠ Rx cyl

We have
RESIDUAL ASTIGMATISM

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Formula
RA = Rx cyl - Δ K

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Can use a formula:

Total Power = CL + Tear Lens

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Rigid Gas Permeable lenses are NOT like SCL

Depends on HOW you fit the GP ,and often there is no ONE correct answer….

There can be MORE THAN 1 DESIGN of a GP lens that works for a single patient

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Now that we are familiar that the

89

More than 1 GP Design can fit a patient…

Different Philosophies…..can achieve :

1. Good Fit
2. Good Vision
3. Minimal Corneal Disruption

90

KERATOMETRY READINGS are of PARAMOUNT importance when fitting a GP lens

A patient with a **-2.00 Sph** Refraction and K reading of **44.00 D**

Will have a significantly different lens to fix their vision than

A patient with a **-2.00 sph** refraction and a K reading of **42.00 D**

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4)Lid Anatomy?

Lid Attachment

Interpalpebral

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Lid Attachment

Larger OAD & Flatter CPC

Tucked under upper lid

93

Interpalpebral

Smaller OAD & Steeper CPC

Fit between Lids

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I prefer **Lid Attachment** fit

Larger OAD & Flatter CPC

Tucked under upper lid

Better comfort

Better stability

95

Some Other practitioners prefer

Interpalpebral

Smaller OAD & Steeper CPC

Fit between Lid

Better for wide fissure or steep Ks (K conus)

96

More than 1 GP Design can fit a patient...

Different Philosophies.....

97

Measuring Radius of Curvature of CL

- Use a Radiuscope
  - In mm
    - To convert to diopters, Use 337.5/r (in mm)
- https://www.youtube.com/watch?v=SO_KBlv7PIk

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Steps on using radiuscope for spherical lens:

1. Clean lens
2. Fill lens holder with saline/mps (do NOT overflow)
3. Place clean lens CONCAVE SIDE UP into the lens holder
   - CONCAVE UP as we are looking to measure the backside/posterior of lens
4. Move table until lens is placed directly under the aperture (may see green reflection of lens)
5. Move table up and center lens until you see your first retical.
6. Once centered and in focus, NOW SET MACHINE TO 0.0
7. Lower table while looking into eyepiece until you see light filament
8. Continue to lower table until you see reticle AGAIN... bring into focus with fine focus knob
9. Note number on machine, record as radius of curvature

99

https://www.optl.info/videos/radioscope.htm

100

Measuring thickness (using Thickness gauge)

1. Ensure reading ZERO (calibrate if indicated)
2. Open calipers
3. GENTLY place lens between calipers and close
4. Ensure calipers are closed on CENTER of lens
5. Record value in mm.
    1. Generally 0.12-0.20 mm or so in thickness

101

Measuring thickness (using Thickness gauge)

1. Normally Minus lenses are thin .12 mm or so…
1. HIGH PLUS GP may have significantly higher CT THICKNESSES!!!!

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Measuring Diameter

- Place clean lens in Slot gauge — CONCAVE SIDE DOWN, don't scratch front of the lens!!
- Gently slide lens down until both sides are touching the edge of the gauge
- Take reading — DO NOT FORCE, may flex lens (result =SMALLER THAN ACTUAL VALUE)

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Measuring Back Vertex Power

- Place Clean Lens in **Hexagonal CL holder**
    - Concave down (similar to spectacle lens)
- Center lens in lensometer (use lens table)
- Neutralize power (similar to ophthalmic Lens) and record result

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POZ

- Arguably, possibly most difficult/subjective
- Place lens in magnifier
- Look up at light source
- Position lens and evaluate peripheral curves and POZ compared to OAD

105

POZ

- Arguably, possibly most difficult/subjective
- Place lens in magnifier
- Look up at light source
- Position lens and evaluate peripheral curves and POZ compared to OAD

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GP lens modification

Less common with new manufacturing techniques, coatings, designs

Similar to making patterns in Ophthalmic Optics

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What parameters can you adjust in a GP after you have received it?

1	2	3	4	5
REDUCE OAD	REDUCE OZ	Reshape or polish Edges	Polish Surfaces	Adjust power (VERY SLIGHTLY)

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What parameters can you NOT adjust in a existing GP?

1	2	3	4	5
Increase OAD	Increase OZ	Steepen Peripheral Curves	REDUCE Peripheral Curves	Adjust power More than 0.50 Diopter

110

Ideal Contact Lens Material Characteristics

- Inert
- Transparent
- Stable
- Durable
- Provides high quality optics
- Permeable to gasses (O2 and CO2)
- Capabilities to fight microorganisms
- Bacteriostatic Bactericidal
- UVA filtration

111

Ideal Contact Lens Material Characteristics

- Machineable
- Comfortable to wear
- Wettable by tear film
- Deposit resistant
- Easy to care for
- Relatively inexpensive

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FDA Material Groups Hydrogel

FDA Group	Water Content (Percentage)	Ionicity
I	<50%	Nonionic
II	>50%	Nonionic
III	<50%	Ionic
IV	>50%	Ionic
V	-	-

* Being ionic to pH range from 6.0 to 8.0.

113

FDA Classifications

- "Daily Wear" less than 24 hour wear and no overnight usage
- "Disposable" single usage than thrown away or discarded.
- "Extended Wear" 7 days and 6 nights consecutive wear before removal.
- "Continuous Wear" 30 day and nights of continuous wear.

114

Lens Replacement Schedule

- Manufacturer recommends replacement schedule
- Not approved by FDA
- Depends on;
  - patient history
  - practitioner preference
  - type of lens care system

115

Lens Material Properties

- Oxygen permeability/transmissability
- Index of refraction
- Tensile strength
- Surface wetting angle
- Resistance characteristics
- Flexural characteristics
- Water content (hydration)
- Wetting characteristics

117

Measuring Permeability

Dk: oxygen permeability

118

Measuring Transmissibility

Lens O_2 transmissibility Dk/t

119

Non-Hydrogel Soft Lenses
Silsoft Silicone Lens

- SilSoft Aphakia
- Pediatrics / Adults

121

Soft Lens Fitting

Patient Information
- Slit lamp evaluation
- Keratometry/Topography
- HVID (Horizontal Visible Iris Diameter)
- Refraction

122

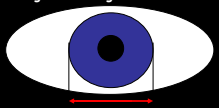
Factors That Influence On-Eye Performance

- Corneal curvature
- Horizontal visible iris diameter
- Eyelid anatomy
- Tear film quality

123

HVID
Horizontal Visible Iris Diameter

Select a diameter 2mm larger than the HVID for good coverage and centration



124

Measuring HVID

125

Tear Break up Time (BUT)

127

Soft Custom

- Considered for patients who cannot tolerate a "hard" or hybrid lens.
  - The posterior surface of the lens has a steep central base curve intended to match the average central K reading.
  - The fitting curve is similar to the base curve of a standard soft lens.

128

Custom Lenses

- Alden Base curves: 8.3 – 8.9
  Diameters: 13.0 – 14.5 mm
- Hydrosoft sphere
  Base Curves: 8.3-9.2
  Diameter: 14.2 15.0 mm

129

Custom Lenses

ABB/Concise Definitive Sphere
Toric/Custom toric
MTO
Sihy
Standard Base Curves
8.3,8.6,8.9,9.2
Diameter 14.0,

130

Fitting Guidelines

- Diagnostic Lens Selection
  - Base curve selection
  - Diameter of lens
  - Power
  - Desired wearing schedule

131

Proper Soft Lens Performance

- Comfort
- Good stability
- Full corneal coverage
- Push up test
- Maintain corneal integrity

132

Push up Test

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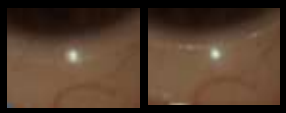
Push Up Test



135

LARS

- LEFT ADD
- RIGHT SUBTRACT

136

Soft Toric Lens Power

-
  - For every "minute" of rotation, compensate 6 degrees
  - For every "hour" of rotation, compensate 30 degrees

137

Methods of Stabilization

- Prism Ballast
- Double Slab Off
- Back Surface Toric
- Combination of the above

138

Axis Orientation

Markings on the soft toric lens indicate how the lens orients on the eye

139

Axis Orientation

- If the lens does not orient at the predetermined location (center hash mark at 6 o'clock)
- It is necessary to compensate for the rotation

Slit Lamp beam

140

Axis Orientation
LARS

LEFT rotation
ADD amount of deviation to the **cylinder** axis of the spectacle correction

RIGHT rotation
SUBTRACT amount of deviation from the cylinder axis of the spectacle correction

141

142

143

Prism Ballast

- A gradual increase in the thickness of one edge which aids in the stabilization of the lens

144

Soft Toric Lens Follow-Up

- Patient's ordered lens will have the same orientation as the diagnostic lens
- Compensating for the rotation of the lens will not result in the lens resting in a different location

147

Factors Contributing to Toric Hydrogel Success

- Normal to loose lids
- Lower lid margin tangent to limbus
- Cylinder on or near 180 / 90

148

Factors Contributing to Hydrogel Toric *Failures*

- Little or no Spherical component
- Steeper / flatter than average K's
- Narrow palpebral fissures
- Refractive astigmatism >2.75

149

Proper Toric Soft Lens Performance

- Criteria
  - Comfort
  - Good stability
  - Full corneal coverage
  - Push up test

150

Presbyopic Contact Lens Alternatives

Reading glasses over distance CL

Monovision
- Extended Wear
- Toric Lenses
- Disposable Lenses
- RGP Lenses

Simultaneous Vision
- Aspheric Lenses
- Diffractive Lenses
- GP lenses

Alternating Vision
- GP Lenses

151

Lens Designs

Simultaneous Vision
Images are focused on the retina at the time

Brain must sort out the images

Requires adaptation period

Alternating Vision
Separate focusing points

Must translate properly

152

Soft Lens Multifocals

- Work on the principle of simultaneous vision
- Near and distance images are supplied to the brain and the brain "sorts out" the image on which it wants to focus

153

Soft Lens Multifocals

- Will perform best for near and intermediate or distance and intermediate ranges
- Will allow near vision at all gazes
- Change of focus without image suppression

154

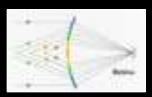
Soft Multifocal Options

- Aspheric Center Distance
- Aspheric Center Near
- Bi-Concentric Center Distance
- Bi-Concentric Center Near
- Alternating Concentric Rings

155

Simultaneous Vision CL's

- Light passes through distance and near optic portions of lens and falls on the retina simultaneously
- Person may perceive both distance and near images at once ("ghosting")



156

Soft Lens Multifocals Concentric

- Center near
- Center distance
- No true intermediate area
- Optical Zone varies by design

157

Balanced Progressive Technology™

Proclear / Biofinity Multifocal

159

Soft Lens Multifocal Toric

- Same fitting strategy as toric lenses
- Same fitting strategy as for multifocal lenses
- Combine the designs
- Adaptive period essential

160

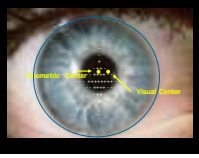
Aspheric Simultaneous Multifocal

Advantages
- Easy to fit
- Comfortable
- Near VA in all fields of gaze
- Not gaze dependent

Disadvantages
- Astigmatism amount
- Pupil size dependent
- Limited add power

161

Cause of Multifocal / Bifocal SCL Failure



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Gas Permeable Materials

- Silicone: Permeability
- Methymethacrylate: optical quality, durability
- Flourine: wettability, deposit resistance
- Wetting agents: resist surface deposits
- Cross linking agents: polymer stability
- Dyes: tints

168

GP Materials DESIGN OPTIONS

- SPHERICAL
- ASPHERIC
- FRONT SURFACE TORIC
- BACK / BITORIC TORIC
- BIFOCALS/MULTIFOCALS
- Oblate designs
- SCLERAL

171

GP Lens Power Rules

1) Put the Rx in minus cylinder
2) Vertex any power greater than +/- 4.00D
3) If the amount of refractive cylinder is similar to the amount of corneal cylinder, the rigidity of the lens will correct the astigmatism
4) Determine the tear lens created between the corneal surface and the base curve of the lens

173

GP Lens Power Rules

A minus tear lens is created when the base curve of the contact lens is fit flatter than the flattest "K" reading

174

GP Lens Power Rules

A plus tear lens is created when the base curve of the contact lens is fit steeper than the flattest "K" reading

175

GP Lens Power Rules

"SAM"	"FAP"
When a rigid lens is fit *steep*, add the same amount of *minus* to compensate for the plus tear lens	When a rigid lens is fit *flat*, add the same amount of *plus* to compensate for the minus tear lens

176

"SAM" Steep Add Minus

EXAMPLE:

Flat "K"	43.00 D
Base Curve	43.25 D
Tear Lens Created	+0.25 D
Patient Rx	-3.50 -1.00 x 180
Add to Compensate	-0.25 D
Final Lens Power	-3.75 D

177

"FAP"
Flat Add Plus

EXAMPLE:

Flat "K"	43.00 D
Base Curve	42.50 D
Tear Lens Created	-0.50 D
Patient Rx	-3.50 -1.00 x 180
Add to Compensate	+0.50 D
Final Lens Power	-3.00 D

178

With the Rule Astigmatism

- Horizontal meridian is least curved
- Vertical meridian is most curved

K's 42.00@180 / 43.00@90
Rx -3.00 -1.00 x 180

179

With the Rule

180

Against the Rule Astigmatism

- Horizontal meridian is most curved
- Vertical meridian is least curve

K's 44.00@180 / 42.00@90
Rx -3.00-2.00 X 90

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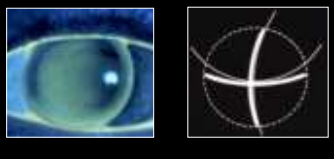
Against the Rule



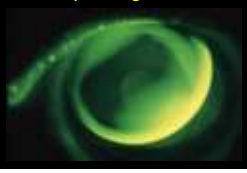
183

Oblique Astigmatism

- Two principle meridians are located diagonally
- K's 42.00@135 / 44.00@45
  Rx -3.00-2.00x135

185

Oblique Astigmatism



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Eye Lid Anatomy

·Apical alignment
Upper lid attachment

·Apical clearance
Intrapalpebral

188

Lid Position

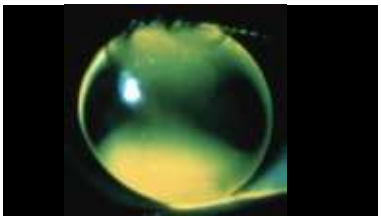
If the upper lid positions over the superior cornea, fit the lens with the apical alignment philosophy

189

GP Bitoric Lens Candidate

A bitoric GP lens Is needed when a spherical GP lens does not result in an acceptable fit due to a high degree of corneal astigmatism.

191



193

Fluorescein Pattern Alignment

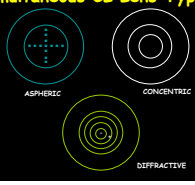
194

GP Multifocals / Bifocals

- Aspheric
- Concentric
- Diffractive
- Translating / alternating

195

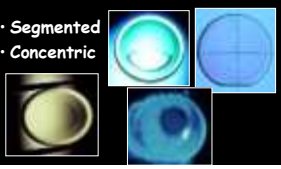
Simultaneous CL Lens Types



196

GP Alternating / Translating Bifocal Lenses

- Segmented
- Concentric



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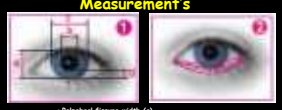
Translating Bi focal Measurement's



- Palpebral fissure width (a)
- Pupil (b) diameter and HVID (c)
- Lower lid height to lower pupil (d)
- Lid position
- Lid tonicity

198

Translating GP Bifocals

- Lid Dynamics
  - Upper lid travels down
  - Lower lid travels nasally

199

GP Alternating / Translating Bifocal Lenses

- Prism ballast
- Slaboff
- May be truncated, rests on lower lid

200

Translation Dependent Upon:

- Lower lid position
- Lid tension
- Pupil size
- Vertical palpebral aperture
- Tear volume

201

Translating Vision CL Limitations

- Effectiveness dependent on translation
- Must be rotationally and vertically stable
- Discomfort due to thick lens design
- Variable visual performance

203

Contraindications to Translating Bifocals

- Low distance correction
- ATR astigmatism
- Demanding intermediate needs

204

Low Riding Translating

205

Hi Riding Translating

206

Irregular Astigmatism

- Principle meridians are not perpendicular
- In certain cases they are distorted
- E.g. keratoconus, trauma, post surgical

- K's 42.00@10 / 44.00@70
  2+ Distortion
  Rx -3.00-3.50x15 20/30

207

Indications for CL Correction of Irregular Astigmatism

- Corneal dystrophy
- Ectasias
  - Keratoconus
  - PMD
- Infection / ulcer
- Ocular trauma cornea

- Surgical
  - Penetrating Keratoplasty
  - Incisional Keratoplasty
  - Ablative keratoplasty

208

Irregular Astigmatism Vision Strategies

- RGP designs
  - Corneal
  - scleral
- Synergize
- Thick or custom hydrogels
- Piggyback /Tandem

209

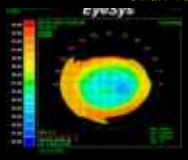
Irregular Astigmatism Gas Permeable Designs

- Spherical
- Aspheric
- Post Graft designs
- Limbal designs
- Oblate geometry designs
- Semi – sclera lenses
- Sclera lenses

- DIAGNOSTIC FIT AND OVER-REFRACT

210

Oblate Cornea



- Post refractive
- Radial keratopathy
- Lasik
- Photorefractive keratectomy
- Phototherapeutic keratectomy
- Penetrating keratoplasty

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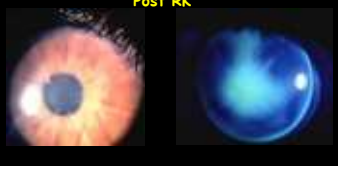
Irregular Astigmatism Post RK



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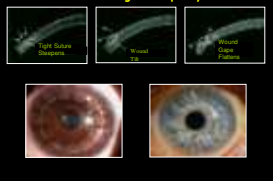
Post-Irregular Astigmatism Topography Penetrating Keratoplasty

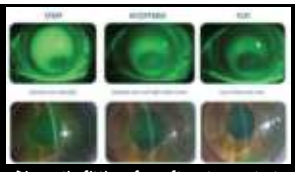


216

Ordering GP Lenses

- Base curve
- Power (Sphere)
- Diameter / optical zone
- Design, spherical, aspheric,
- Peripheral curves
- Edge design, plus, minus lenticular, thin
- Manufacturer
- Material

220



Diagnostic fitting of a soft custom contact

Courtesy of Bausch and Lomb - NovaKone

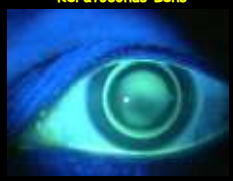
223

GP Lens Fitting

Spherical Lens Design *Keratoconus Lens Design*

225

Keratoconus Lens



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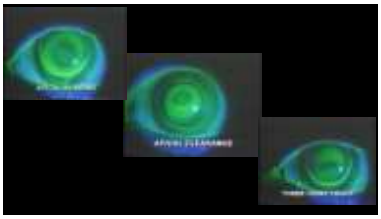

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Hybrid Lenses

- Provide the best features of two types of lenses.
- A hybrid of "hard" and "soft" lenses.
- Manufactured by SynergEyes®

228

Why hybrid technology?

- Benefits:
  - Crisp Acuity
- Challenges:
  - Discomfort
  - Challenging to fit
  - Foreign body migration
  - Lenses dislodging

230

Hybrid Fitting

- Empirical fitting
  - Requires a topography with the following information :
    - Keratometry readings
    - Eccentricity data, often listed as e, e2, CEI, Shape Factor, or Q value (measured with a Pentacam)
    - HVID
    - For power: Previous RGP or scleral data with base curve and over-refraction.

231

Hybrid Fitting

- Diagnostic lens fitting
  - Fluorescein
  - Trial lens
    1. 250 μ vault and 8.4 radius diagnostic lens
    2. 300 μ vault and 8.4 radius diagnostic lens
  - Determine
    - Vault (base curve)
    - Peripheral skirt radius
    - Power

232

Hybrid Fitting

- The goal is to achieve 100-150 microns of apical clearance at initial fit and then expect 30-60 microns of settling during wear. This will ultimately achieve a fit with 50-100 microns of apical clearance.

233

Courtesy of SynergEyes

234

Ordering SV or Toric Soft Lenses

- Base curve
- Power (Sphere, cylinder, axis)
- Diameter
- Design, spherical, aspheric, computer enhanced
- Replacement schedule
- Manufacturer

235

Tandem/Piggy Back

- Used to improve comfort in a GP lens fit
- Used for all types of irregular astigmatism
- Fit initial GP lens
- Use silicone hydrogel lens
- Use Daily disposable hydrogels

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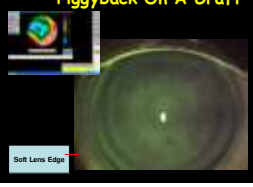
Piggyback On A Graft



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SCLERAL LENSES DEFINED

- A scleral lens is much larger than a corneal lens and is sometimes referred to as a haptic lens
  "haptic" from Greek word for "fasten onto"
- A scleral lens vaults the cornea and lands or "fastens onto" the sclera (visible white of eye)

242

APPLICATIONS FOR SCLERALS

- Keratoconus (oval, nipple) & Keratoglobus
- Pellucid marginal degeneration
- Post penetrating keratoplasty
- RK and lasik induced ectasia
- Any compromised and/or irregular cornea
- High degree of corneal toricity
- Post trauma, severe dry eye, or neurotrophic keratitis
- Normal corneas for comfort and stability

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Scleral Lens

250

Scleral Lens

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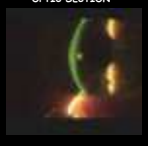
THE FLUORESCEIN/TEAR LENS PROFILE

DIFFUSE ILLUMINATION

OPTIC SECTION



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Scleral Lens Bubbel

255

Scleral Lens Debris Tear Layer

256

Material Crazing

259

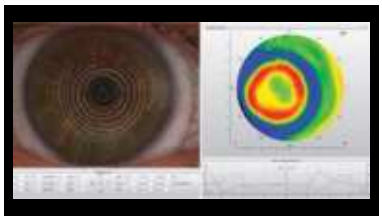
Scleral Lens Fitting Criteria

- Proper diameter
- Corneal lens clearance
- Limbal clearance
- Scleral lens landing
- Visual acuity

260

Scleral Lens Debris on Surface

261



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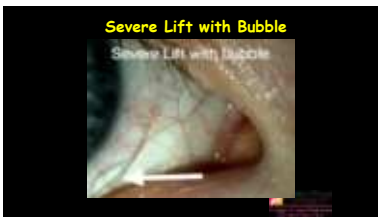

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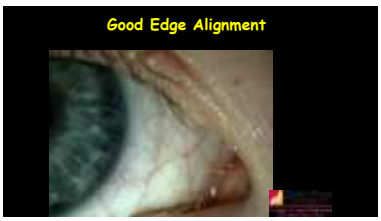

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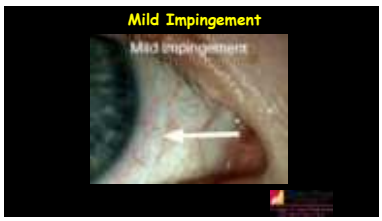

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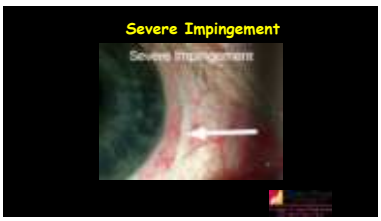

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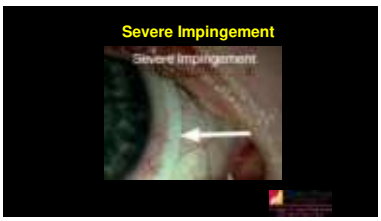

277

Pachymetry

- Corneal pachymetry involves measuring the thickness of the cornea.
- Two types of techniques used to determine corneal thickness: **ultrasound** and **optical**.
- OCT uses light waves to examine eye structures
- Thickest in the periphery at the limbus at around 700–900µm and thinnest centrally at the corneal apex at around 544µm

278

Surface Treatments

- Plasma treatment
- Process on a finished lens
- High-energy radio waves bombard the surface
- Exotic oxygen radicals strike the surface, dislodging hydrocarbons "oils"
- The surface of the lens are rearranged
- (Kurtis Brown Menicon)

286

Material Crazing

288

Care Regimen

Scleral lenses should be cleaned each night and disinfected using a GP disinfecting or multipurpose (MPS) solution or by using a hydrogen peroxide oxidative solution. The surface of the lens can be conditioned using a soft MPS that contains hyaluronic acid to enhance surface wetting prior to application.

The same solution that you use to apply the lens (non-preserved, non-buffered 0.9% sodium chloride solution), should not be used to clean the lens.

289

Ordering Soft Lenses

- Base curve
- Power (Sphere, cylinder, axis)
- Diameter
- Design, spherical, aspheric, computer enhanced
- Replacement schedule
- Manufacturer / material

290

Ordering Gas Permeable Contact Lenses

- Base curve
- Power (Sphere, cylinder, axis)
- Diameter / optical zone
- Design, spherical, aspheric, oblate
- Edge design, plus, minus lenticular, thin
- Material
- Manufacturer

291

Ordering Bifocal /Multifocal GP Lenses

- Base curve
- Powers / Sphere and Add power
- Diameter / optical zone
- Design, spherical, aspheric, front or back
- Design translating, seg height, prism
- Edge design, plus, minus lenticular, thin
- Material
- Manufacturer

292

Ordering Irregular Cornea GP Lenses

- Base curve
- Power (Sphere)
- Diameter / optical zone
- Design, spherical, aspheric,
- Peripheral curves
- Edge design, plus, minus lenticular, thin
- Material
- Manufacturer

293

Ordering Scleral Lenses

- Base curve or SAG value
- Power sphere, cylinder, axis, rotation
- Diameter / optical zone
- Design, spherical, aspheric, toric, multifocal
- Peripheral curves, limbal zone
- Edge lift
- Material
- Manufacturer

- Material

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