SCLERAL LENS FITTING AND ASSESSMENT

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FINANCIAL DISCLOSURE

I am the Manager of Consultation & Customer Service for Bausch + Lomb Specialty Vision Products

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HISTORY OF SCLERAL CONTACT LENSES

Friedrich a. Muller - German glassblower made first scleral non-optical lens.
The lens had a clear corneal section with an opaque scleral portion

August Muller - made lenses to correct his myopia.
He was the first to explain lacrimal exchange and assess the radius of both the cornea and sclera.

1887 — 1888 — 1889

Adolf Fick - Swiss physician - made first refractive-powered contact lens.
- 18-21mm diameter lenses were designed to correct traumatized and/or irregularly shaped corneas.

Illustration courtesy the Contact Lens Collection of the College of Optometrists

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HISTORY OF SCLERAL CONTACT LENSES

1909 – Muller brothers begin regular production of blown glass lenses

1912 – Zeiss begins the production of contact lens fitting sets

Illustration courtesy the Contact Lens Collection of the College of Optometrists

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HISTORY OF SCLERAL CONTACT LENSES

1927: Adolf Muller-Welt – produced his first molded fluidless contact lens

- He designed lenses to allow lacrimal fluid to circulate between lens and cornea.
- He was first to develop large trial sets/inventories and, with Joe Breger, initiated one of the first large CL laboratories in the U.S.

Illustration courtesy the Contact Lens Collection of the College of Optometrists

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HISTORY OF SCLERAL CONTACT LENSES

1929 – Leopold Heine – suggests a fitting technique which uses afocal lenses
- The lenses correct ametropia by using different corneal radii which vary the liquid lens power

1930–1934 – A. Josef Dallos – Used eye molds to design 22-23mm lenses
- The benefits of the eye mold included a more secure, controllable and comfortable fit
- Fenestrations minimized adhesion and increased lacrimal exchange

1935 – C.H.S. Sattler – after using Zeiss lenses for four years, describes signs of corneal haze after a few hours of lens wear

1938 – Theodore Obrig – discovered using cobalt blue filter for illumination causes fluorescein to fluoresce

Obrig

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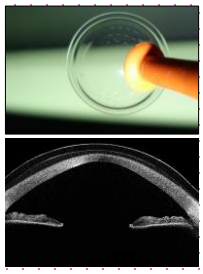
SCLERAL LENS FITTING GOALS

Even though there are multiple scleral lens designs, they all share the same basic lens geometry and principles

- The Lens is completely supported by the sclera
- Complete corneal and limbal clearance



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SCLERAL LENS INDICATIONS OCULAR SURFACE DISEASE

Scleral lenses create a liquid cushion
- Neutralizes irregular corneal shape
- Bathes the cornea with fluid reservoir to protect surface from exposure

Helps with
- Sjogren's Syndrome
- Stevens-Johnson Syndrome
- Graft vs. Host Disease
- Persistent epithelial defects

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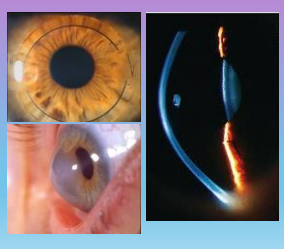
SCLERAL LENS INDICATIONS IRREGULAR CORNEA

Corneal ectasia
- Primary ectasia
  - Keratoconus
  - Keratoglobus
  - Pellucid marginal degeneration



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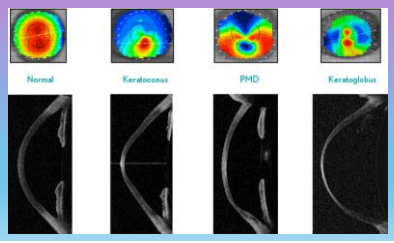
SCLERAL LENS INDICATIONS IRREGULAR CORNEA



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SCLERAL LENS INDICATIONS IRREGULAR CORNEA

Cornea ectasia
- Secondary ectasia
  - Post-LASIK
  - Post-PRK
  - Post-RK

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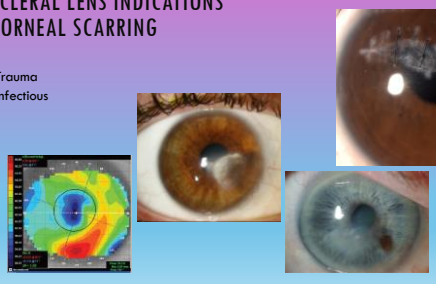
SCLERAL LENS INDICATIONS CORNEAL SCARRING

- Trauma
- Infectious



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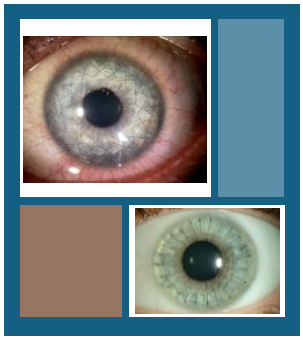
SCLERAL LENS INDICATIONS

PENETRATING KERATOPLASTY



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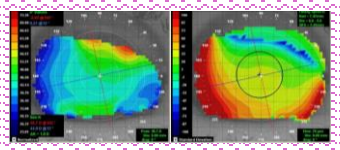
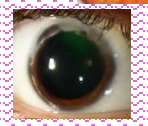
SCLERAL LENS INDICATIONS CORNEAL DEGENERATION/DYSTROPHY

- Terrien's Marginal degeneration
- Salzmann's nodular dystrophy





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SCLERAL LENS INDICATIONS

- Poor comfort/tolerance from corneal gas permeable lenses
- Limbal stem cell deficiency
- Corneal Neovascularization
- Piggyback patients
- Athletes

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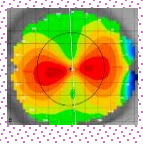
SCLERAL LENS INDICATIONS REFRACTIVE ERROR

High refractive error
- Hyperopia, myopia, aphakia
- Astigmatism
  - Regular and irregular
  - With the rule
  - against the rule
- Presbyopia
  - Multifocal lens options with simultaneous vision designs



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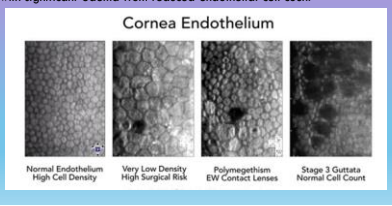
SCLERAL LENS CONTRAINDICATIONS

Corneas with significant edema from reduced endothelial cell count



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SCLERAL LENS CLASSIFICATIONS

Corneal lens
- A gas permeable lens that rests completely on the cornea

Corneo-scleral lens
- A gas permeable lens that rests partly on the cornea and partly on the sclera

Scleral Scleral Lens Education Society

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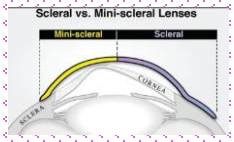
SCLERAL LENS CLASSIFICATIONS

Mini- Scleral lens
- A gas permeable lens that rests entirely on the sclera
- Lens is up to 6mm larger than HVID

Large-scleral lens
- A gas permeable lens that rests entirely on the sclera
- Lens is more than 6mm larger than HVID



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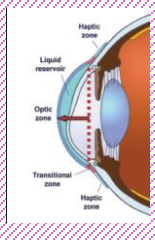
SCLERAL LENS TERMINOLOGY & DESIGN

Scleral lens designs are classified as either:
- Spherical (Non-toric back surface)
- Toric (Front, back or bitoric)

There are 3 main components to a scleral lens
- The optical zone
- The transition zone
- The Haptic/landing zone



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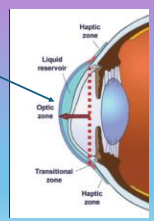
SCLERAL LENS TERMINOLOGY & DESIGN

The optical zone
- Center zone of the lens
- Varies in size depending on overall lens diameter
- Back surface optical zone will vault the cornea but should have a similar shape as the cornea
  - corneo-scleral lens manufacturers, suggest "feather-touch" on the apex or limbal area
- Tear layer will still neutralize corneal irregularity
- In theory, the same optical power rules apply to scleral lenses as to corneal GP lenses



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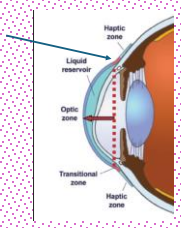
SCLERAL LENS TERMINOLOGY & DESIGN

The transition zone

- Between optical zone and haptic/landing zone
- Also called mid-peripheral, intermediate or limbal zone
- Creates the sagittal height of the lens
- Can be reverse-geometry design for post-refractive surgery corneas
- Very important zone for Cornea-scleral designs so that too much pressure is not applied to cornea due to less limbal clearance
- Different scleral lens designs modify the shape profile of this zone



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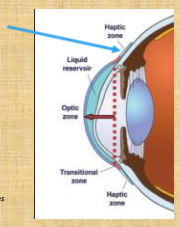
SCLERAL LENS TERMINOLOGY & DESIGN

The Haptic/landing zone

- Part of the lens that lands on the anterior ocular surface and "fits" the eye
- Should be at least 3mm wide to provide good comfort
- Important to evenly distribute pressure to completely vault the cornea
- Can be modified to fit the sclera
  - Flatter or steeper by changing the landing zone angle
- Some designs specify landing zone *radius of curvature*, others use *landing angles*



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SCLERAL LENS TERMINOLOGY & DESIGN

Toric Lenses

- Front
  - Improves vision
  - Toric power on front surface of the optical zone
- Back
  - The haptic/landing zone is made toric to improve lens fit
  - Does not interfere with the optical zone
- Bitoric
  - Combines back toric lens geometry (the landing zone) with front toric optics (the optical zone)

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SCLERAL LENS TERMINOLOGY & DESIGN

Front toric lenses are indicated when residual astigmatism is present

This lens must be stabilized to prevent lens rotation
- Prism ballast
- Double slab-off

Uses LARS (LEFT ADD RIGHT SUBTRACT) for toric lens troubleshooting

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SCLERAL LENS TERMINOLOGY & DESIGN

Perform keratometry or topography over the anterior surface of the lens to determine if the cylinder over-refraction is due to flexure or residual astigmatism

Lens flexure can be reduced or eliminated by increasing the center thickness by .04mm

Toric markers assist the practitioner to assess lens rotation and stability

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SCLERAL LENS TERMINOLOGY & DESIGN

Multifocal designs are becoming more popular

Simultaneous vision designs
- Aspheric or concentric
- Both Center Near or Center Distance designs are available

Scleral multifocal advantages over corneal GP designs
- Increased optical zone so less glare/halo at night
- Much more stable fit with less lens movement
- Concentric zones can be better aligned with the visual axis

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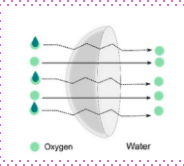
SCLERAL LENS TERMINOLOGY & DESIGN

- Lens materials allow high amounts of oxygen to the cornea, but scleral lenses are thicker than a corneal GP lens
  - Typically .25mm to .40mm thick
  - Increased thickness can decrease the oxygen transmission of the lenses
  - Larger diameter lenses can be thicker than corneo-scleral lens



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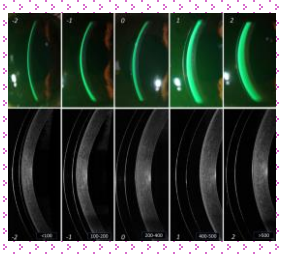
SCLERAL LENS TERMINOLOGY & DESIGN

3 ways to increase oxygen transmission
- Choose a maximum Dk for the lens material
- Reduce the center thickness of the lens
- Reduce the tear clearance behind the lens



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SCLERAL LENS TERMINOLOGY & DESIGN

Fenestration
- Should be roughly 0.5 mm to 1.0 mm in size and placed in the deepest pooling area over the limbus
- Increases the exchange of tears over the cornea and may help to eliminate waste products from under the lens
- Sometimes added for easier lens removal due to less suction
- Can allow bubbles under the lens but can also allow bubbles to escape
- Lens solution, debris and microorganisms, may accumulate inside the fenestrations hole because difficult to clean

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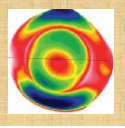
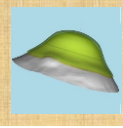
SCLERAL LENS TERMINOLOGY & DESIGN

Impression technique (EyePrintPro.com)
- Specialized equipment and training is required
- A negative mold is created from the impression of the anterior ocular surface
- A digital image of the mold is sent to the computer lathe to cut the scleral lens

Data Driven Freeform technique
- Scleral topography scans the ocular surface and creates a digital image
- Digital image is sent to lathe to cut scleral lens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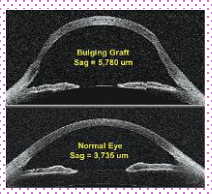
SCLERAL LENS FITTING STEPS

Diagnostic fitting is required to get the best fit

Scleral lenses are fit with sagittal depth

Multiple factors determine the sagittal height of a lens fit
- Lens Diameter
- Radius of Curvature
- Corneal shape
- Scleral shape



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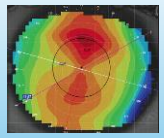
CHOOSING OVERALL LENS DIAMETER

- Determine the patient's HVID
  - Important to have the appropriate lens diameter
  - Helps with scleral alignment
    - Decreases lens fogging and lens decentration
  - Want at least 1.5mm on each side of the landing zone

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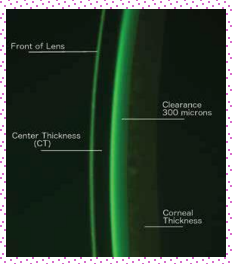

EVALUATE CENTRAL CLEARANCE

- Two ways to determine central clearance
  - Comparison of lens center thickness
    - The lens vial or invoice will have center thickness
  - Comparison of corneal thickness
    - Average corneal thickness is 530 microns
- Lenses will settle 100-200 microns
  - Ideally want 100-150 microns with full settling (after 6 hours)

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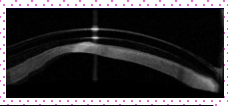
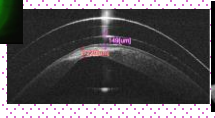
EVALUATE MID-PERIPHERAL CLEARANCE

Clearance should taper through mid-periphery to limbus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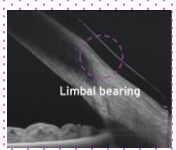
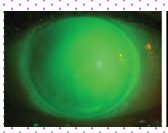
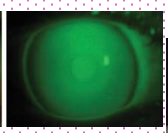
EVALUATE LIMBAL CLEARANCE

- Limbal clearance is critical to not interfere with stem cell function
  - Stem cells produce new epithelial cells
- 50-100 microns of clearance

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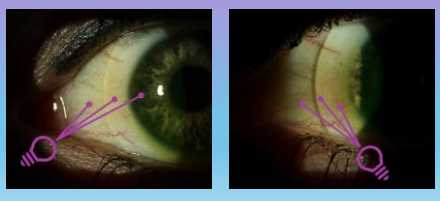
EVALUATE LANDING ZONE

- The landing zone is created to align with the sclera



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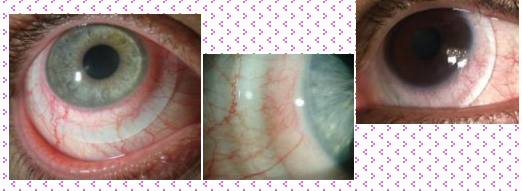
EVALUATE LANDING ZONE

- Toe or Heel Blanching?
  - Toe = too steep
  - Heel = too flat



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OVER-REFRACTION

- An ideal fit will lead to the most accurate RX
  - A decentered lens can induce refractive cylinder
- Vertex Over-Refraction > +/- 4.00D
- If there is sphere-cylindrical OR, then notate any lens rotation
  - Only add front toric RX if the rotation and fit are stable

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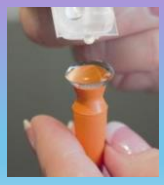
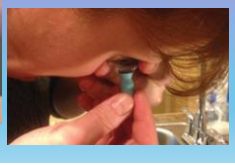
APPLICATION & REMOVAL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GAS PERMEABLE CARE SYSTEMS



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BOSTON ADVANCE FORMULA 3 STEP CLEANING PROCESS

Uses daily cleaner, conditioning solution and liquid enzyme

- Daily cleaner
  - surfactant cleaner; can not be used with all GP lens materials/surface treatments as it will scratch the lenses
  - Used every night and rinsed with saline
- Conditioning/storing solution:
  - A sterile, aqueous buffered, solution containing a cellulose derivative polymer and polyvinyl alcohol as wetting and cushioning agents
- Liquid enzyme
  - Used weekly to remove protein/lipid buildup
- Can not be used with HydraPEG

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BOSTON SIMPLUS MULTIPURPOSE

For cleaning, removing protein, rinsing, disinfecting, conditioning, storing

Recommend rub lens before overnight storage

Rinse with Simplus before lens application

No weekly protein remover needed

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UNIQUE PH MULTIPURPOSE

For cleaning, removing protein, rinsing, disinfecting, conditioning, storing

Recommended that no evening rub required; just rub and rinse in the morning prior to lens application

No weekly protein remover needed

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TANGIBLE CLEAN MULTIPURPOSE

For cleaning, removing protein, rinsing, disinfecting, conditioning, storing

Recommended that no evening rub required; just rub and rinse in the morning prior to lens insertion

No weekly protein remover needed

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CLEARCARE HYDROGEN PEROXIDE SYSTEM

Approved by FDA for use with Soft lenses and GP lenses

Preservative-Free benefits

For added lens wettability, rub and apply GP lens with Boston Conditioner or artificial tears

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DAILY CLEANERS

Alcohol Based Daily Cleaner

Approved for use with:

- Hydrogel Lenses
- Silicone Hydrogel Lenses
- GP Lenses

Can not be used with HydraPEG

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SALINE

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FIT & FOLLOW-UP SCHEDULE
Initial Fitting
Dispense Appt
Vision check
Fit assessment
Lens Application & Removal
Solutions
Wearing Schedule
Start with 4-6 hours day 1
Add 2-3 hours/day
Maximum 10-12 hours until follow-up appt
All follow-up visits
Come in wearing lenses so they are fully-settled
Document how long lenses were on the eye during assessment
1 week follow-up
2-3 week follow-up (afternoon appt so lenses are fully settled)
4-6 week follow-up

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QUESTIONS?

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THANK YOU

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