



# Controversy: To Sleep or Not to Sleep in Scleral Lenses

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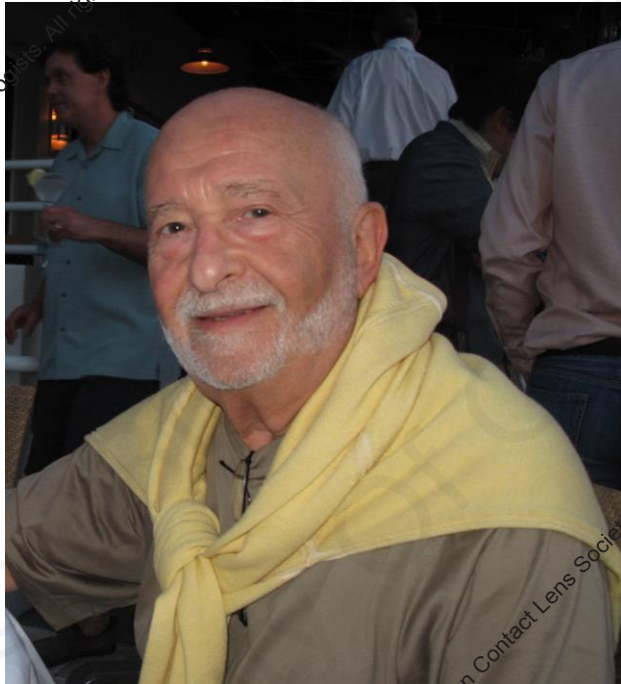
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# Disclosures

- Nothing to disclose



# Perry Rosenthal, MD



1934-2018



# Oxygen



## Physiological Corneal Edema 4%

Mandell RB and Fatt I: Thinning of the human cornea on awakening. *Nature* 208:292, 1965.

Mertz GW: Overnight swelling of the living human cornea. *J Am Optom Assoc* 51:211, 1980



# Oxygen in Theory and in Practice

- Michaud L et al. Contact Lens Ant Eye 2012;35:266–71.
  - Dk > 150, c.t. 250  $\mu\text{m}$ , clearance 100-250  $\mu\text{m}$
- Jaynes JM et al. Contact Lens Ant Eye 2015;38:44–7.
  - Dk 140, c.t. 300  $\mu\text{m}$ , clearance 50  $\mu\text{m}$  yields oxygen tension of 100 mmHg
- Compan V et al. IOVS 2014;55:6421–9.
  - 55 mmHg needs Dk 125, c.t. 200  $\mu\text{m}$ , clearance <150  $\mu\text{m}$
  - n = 8 15.5 corneo-scleral (Dk 100, 300 c.t. 300  $\mu\text{m}$  c.t) 150 and 300  $\mu\text{m}$  clearance  
**1.59% and 3.86% swelling**
- Giasson CJ et al. Optom Vis Sci. 2017;94(4):466-475.
  - **30% decrease** in surface oxygen tension in 18 mm lenses with a vault of 400 compared to 200 microns



# Edema and Overnight Wear

## Corneal Swelling with Overnight Wear of Scleral Contact Lenses

Guy T. Smith, FRCOphth, Kamiar Miresaeidi, FRCOphth, and Kenneth W. Pullum, DipCLP

Cornea 23:29–34. 2004

- 4 subjects
- Dk 80, clearance 200-350 microns, C.T. 0.8mm
- Cell counts ranged between 2729- 3449 cells/mm<sup>2</sup>
- Corneal edema correlated well with endothelial cell counts
- 1 subject demonstrated daytime corneal edema and was omitted from analysis

TABLE 1. Differences between Test Eyes and Fellow Eyes

	Test Eye			Fellow Eye		
	Thickness		Swelling Overnight (% ± SD)	Thickness		Sympathetic Swelling Overnight (% ± SD)
	ScCL Omitted (μm ± SD)	ScCL Worn (μm ± SD)		ScCL Omitted (μm ± SD)	ScCL Worn (μm ± SD)	
Subject 1	527 ± 4	561 ± 7	4.9 ± 3.1	529 ± 6	528 ± 6	-0.07 ± 1.6
Subject 2	583 ± 8	616 ± 12	5.6 ± 1.7	589 ± 8	578 ± 14	-1.95 ± 2.0
Subject 3	539 ± 7	594 ± 9	10.2 ± 1.9	542 ± 5	537 ± 7	-0.91 ± 1.4
Mean (3)	550 ± 5	590 ± 25	7.4 ± 2.6	553 ± 27	548 ± 24	-0.98 ± 1.8
Subject 4	533 ± 5	626 ± 24	17.5 ± 4.9	523 ± 5	540 ± 13	3.25 ± 2.8
Mean (4)	535 ± 23	599 ± 29	10.1 ± 5.6	546 ± 27	546 ± 22	0.008 ± 2.8



# Therapeutic Overnight Wear

- Tappin *et al.* Eye (Lond) 2001 Apr;15(Pt 2):168-72
  - 7 Cases: 6 GP lenses, 1 PMMA
  - Indications: Persistent Epithelial Defect, SJS, Radiation keratopathy, CN VII palsy, S/P Acoustic Neuroma
  - PMMA case: longstanding exposure 2/2 congenital exposure with extensive scarring and neovascularization

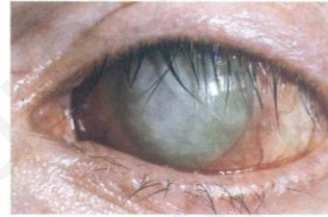


Fig. 5 Case 3. Radiation keratopathy and trichiasis. The left eye, showing trichiasis and corneal scarring, with an RGP Scl CL in situ.



Fig. 6 Case 7. Corneal exposure following seventh nerve palsy, corrected by surgery and partial tarsorrhaphy. The closure shown was the maximum possible, but the eye was quiet and comfortable with the RGP Scl CL in situ.

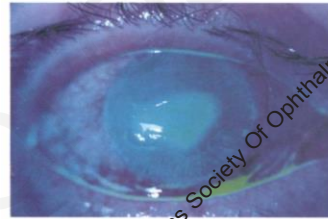


Fig. 7. Case 6. Lesion consequent to exposure and corneal anaesthesia following an acoustic neuroma. The extent of fluorescein staining is shown just prior to commencement of overnight wear.

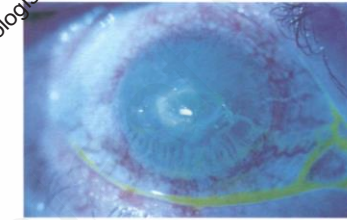


Fig. 8. Case 6. There is a reduction in the size of the central lesion after 2 weeks overnight wear of an RGP Scl CL.



# Persistent Epithelial Defects

- Rosenthal P. *et al.* Am J Ophthalmol 130(1):33–41, 2000
  - 14 eyes 13 patients
  - 7 SJS, 5 Neurotrophic, 1 Sjogren's, 1 OCP of which 12 PKP
  - Prophylactic antibiotic in 12/14
  - 6 failed to heal
  - 4 Microbial keratitis
  - 1 Graft failure



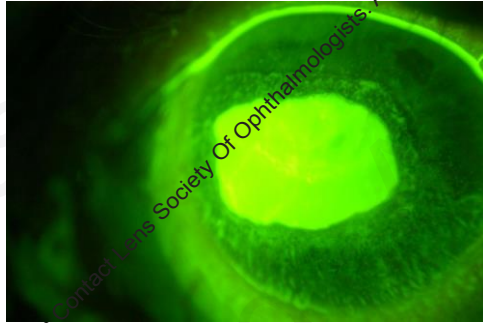


# Persistent Epithelial Defects

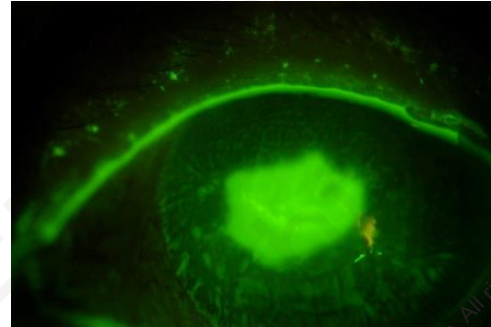
- Lim P. *et al.* Am J Ophthalmol 156(6):1095-1101. 2013
- 20 eyes 19 patients
- 7 GVHD, 5 Neurotrophic, 4 LSCD, 2 SJS, 1 K-sicca, 1 ectrodactyly, 1 ectodermal dysplasia cleft plate (EEC); 8 PKP
- 17/20 healed
- 3 recurred
- No cases of Microbial Keratitis
- Healing Time:  $\leq 7$  days (12 eyes), 8-14 days (3 eyes),  $>14$  days (2 eyes)



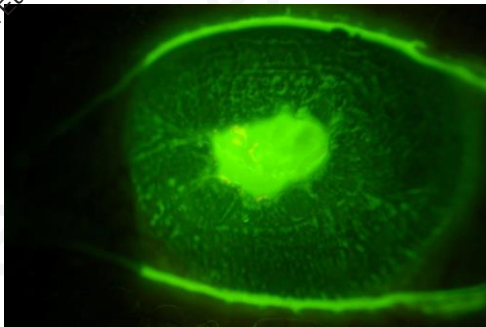
# Persistent Epithelial Defect



Day 1



Day 2



Day 3



Day 5

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# Management of Persistent Epithelial Defects

- Photography white light and cobalt filter
- Extended wear of scleral device
- Daily monitoring
- Antibiotic prophylaxis with preservative free fourth generation fluoroquinolone
- Daily disinfection of device and replenishment of fluid
- Longstanding PED's can be managed with exchange of 2 devices q12 hours
- Weekend monitoring
- DOCUMENTATION!!!!!!



# Case Example

- 61 y.o. F referred for resurfacing PED 1 month s/p patch for perforation
- 3 eye surgeries in prior 6m
  - s/p Phaco CE + PCIOL
  - s/p PPV/AFx/EL/16% C3F8
  - s/p PK Patch graft for descemetocoele
- Secondary Sjögren's syndrome
- Neurotrophic cornea
- ? Stem cell deficient



# Case Example

Entering Treatment by specialist :

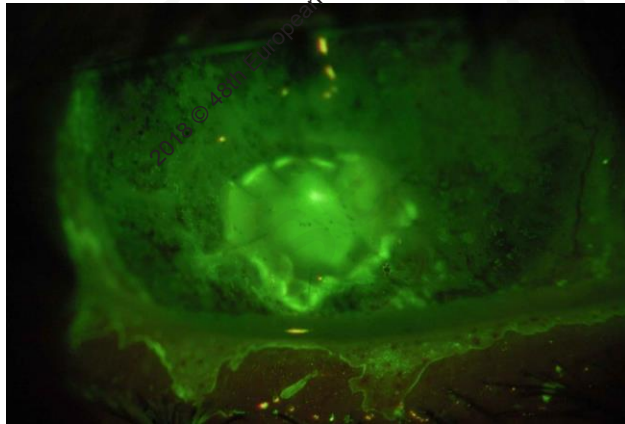
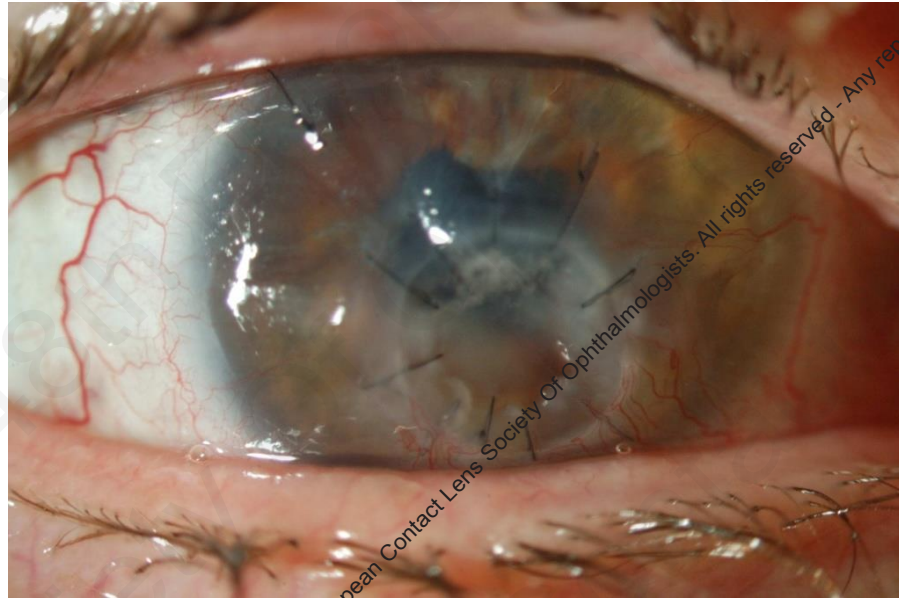
Vigamox QID

PF Pred Forte BID

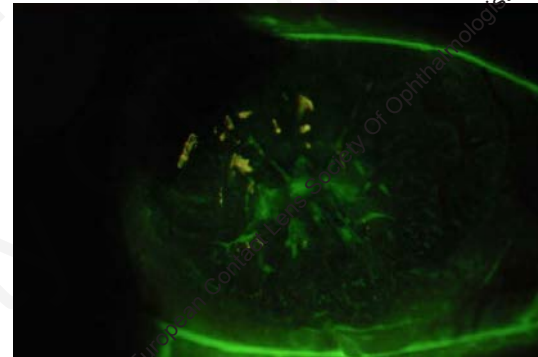
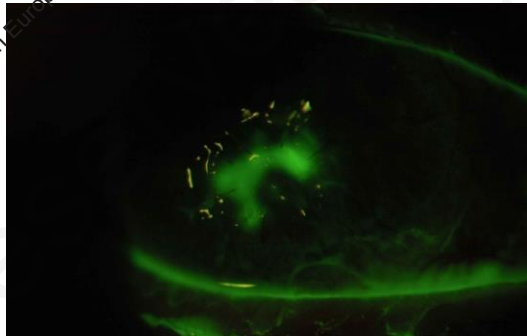
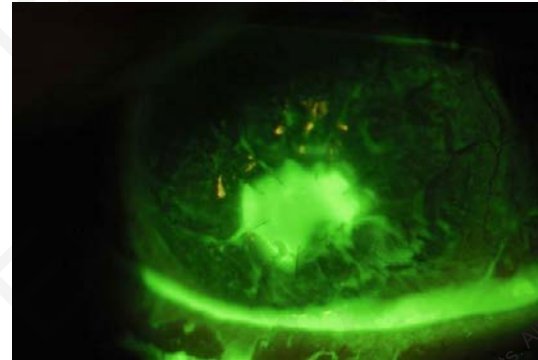
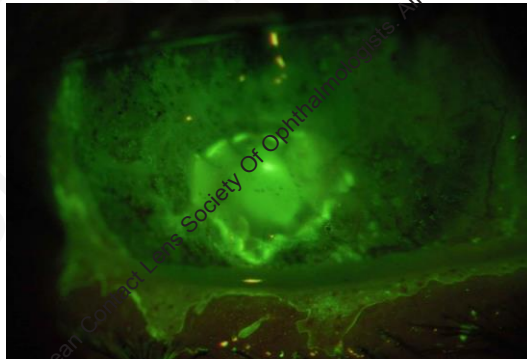
Serum Tears q2h

Doxy 50 mg p.o QD

Bandage CL



# Case Example

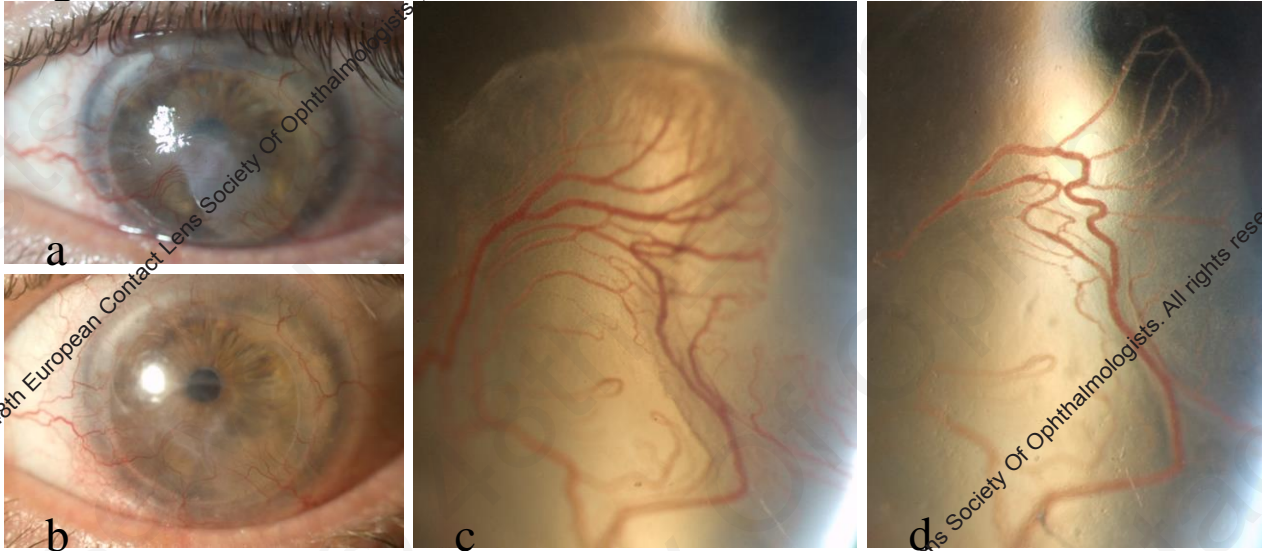


Re-surfaced after 6 days continuous wear and Vigamox in the device



# Novel Applications- Drug Delivery

Figure 2



Keating A., Jacobs D. *Anti-VEGF Treatment of Corneal Neovascularization*. *The Ocular Surface*. 2011 9 (4): 40-51.



# Case Example



October 2007

VA: CF 6'

1w after continuous then daily wear



March 2008

VA: 20/400 6/120 0.05

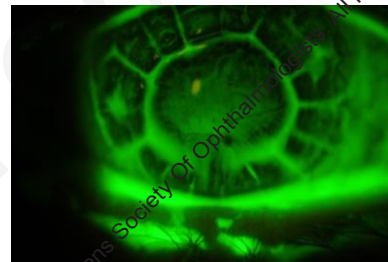
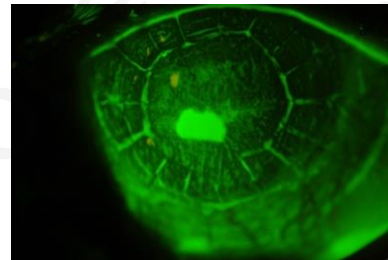
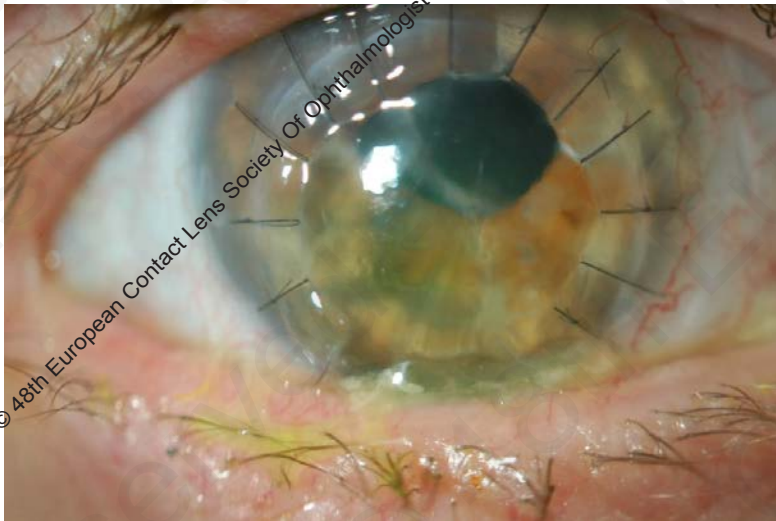
s/p 3 months topical Avastin in lens, suture removal, systemic steroid.

?PK for vision





# Case Example 3 years later...

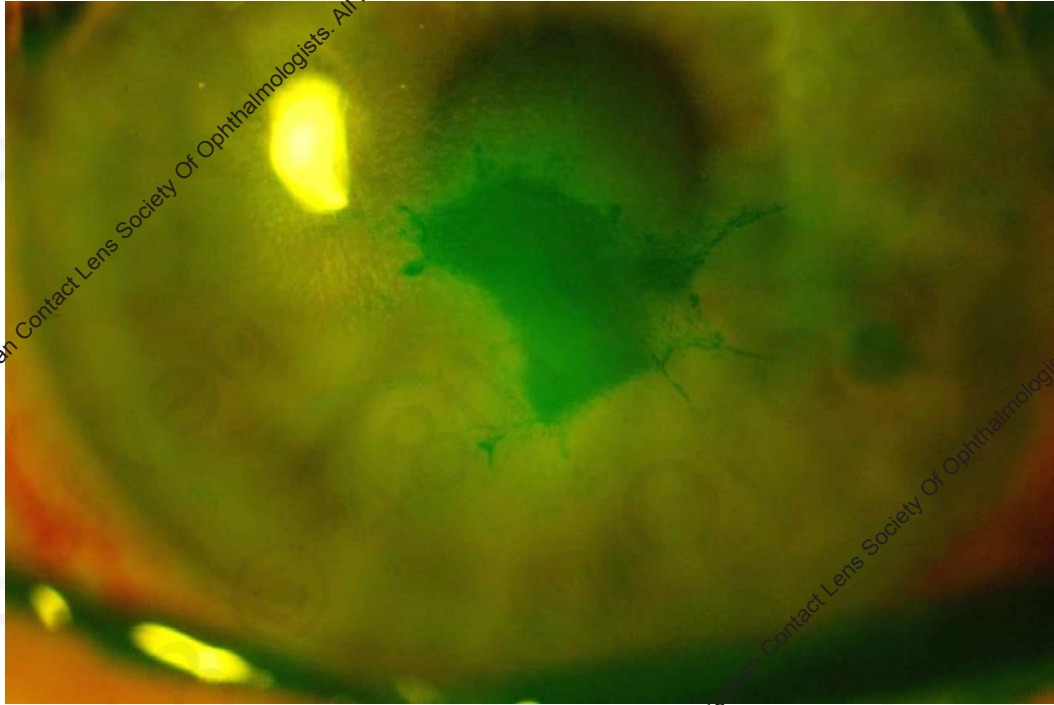


July 2011  
s/p PKP January 2011  
VA: 20/50 6/15 0.40

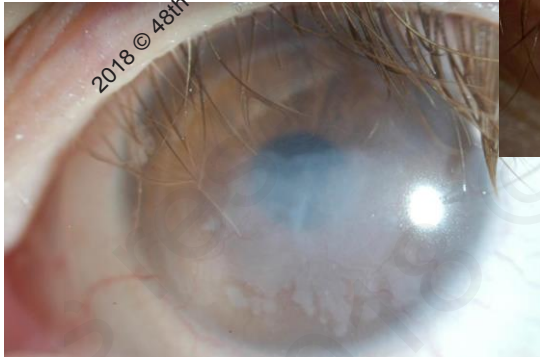
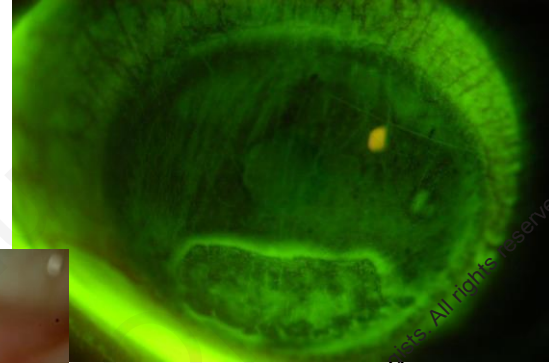
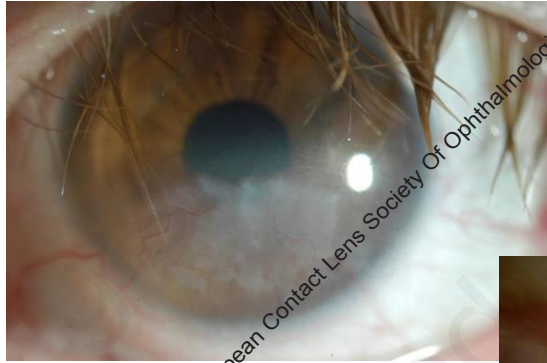
- Overnight wear with lens and one drop Vigamox.
- Resurfaced in 24 hours



# When a PED doesn't heal...



# Support for overnight wear

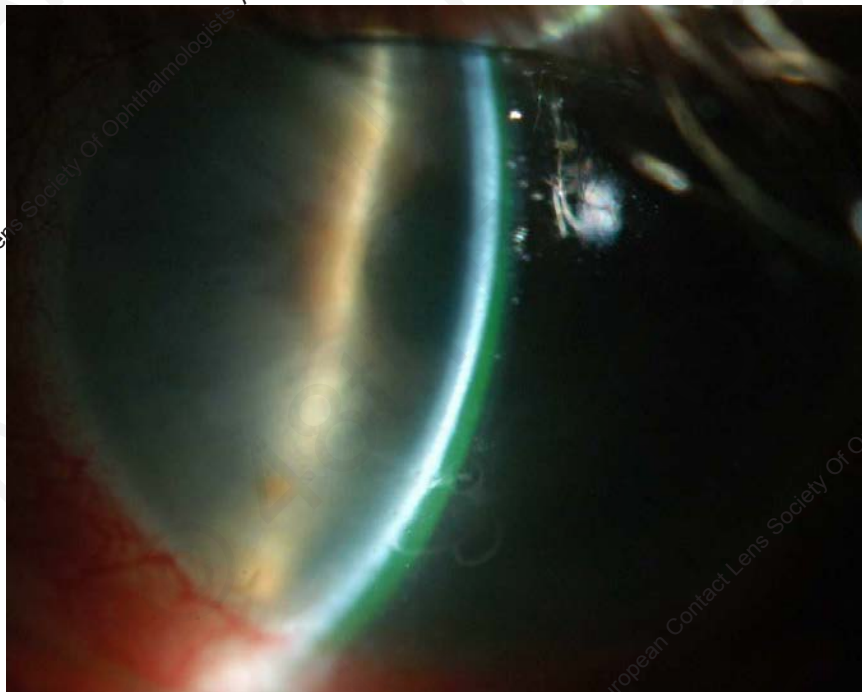


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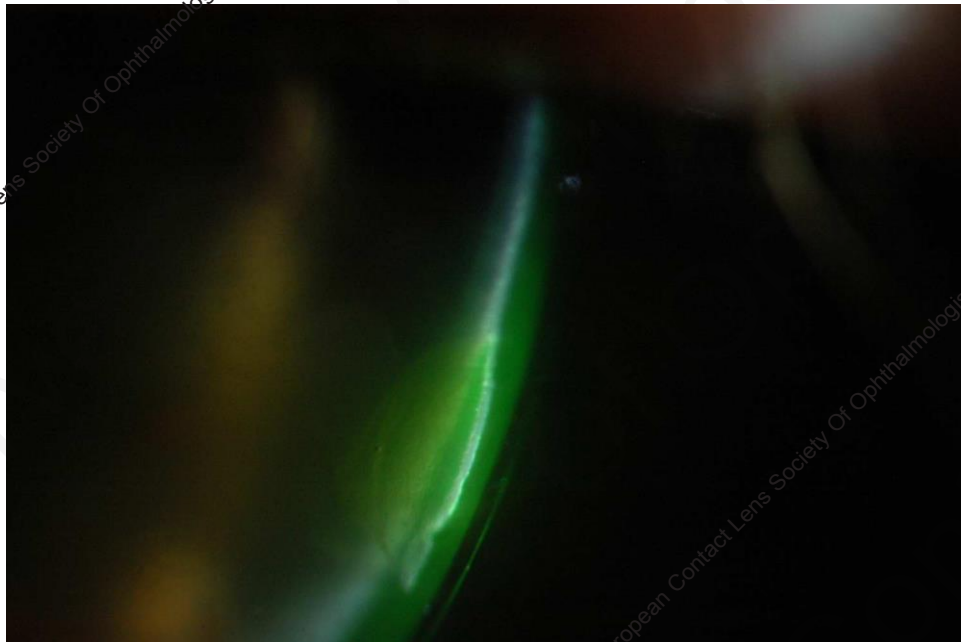
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# Limitations of overnight wear



# Limitations of overnight wear



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# Nighttime Management without Lenses

- Overnight ointment
- Tape tarsorrhaphy
- Nighttime goggles



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# Summary

- Scleral lenses worn overnight increase risk of edema
- Must weigh risks and benefits of patient
- Close monitoring is crucial
- Support the ocular surface when the lens is not worn

