

## Pain, Photophobia, and Ocular Pathology: What you can do to help your patients

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## Pain, Photophobia, and Ocular Pathology: What you can do to help your patients

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### disclosures

#### last 12 months

allergan/abbvie  
bausch health  
novartis  
sun pharma  
kala pharma  
tarsus pharma  
hovione scientia  
silk-tech

#### last 12 months

sydnexis  
eyenovia bio  
laboratoires Thea  
aurinia pharma  
eyevance pharma  
surface pharma  
nevakar, inc.

#### last 12 months

visus therapeutics  
aperta biosciences  
astareal, inc.  
azura ophthalmics  
aldeyra therapeutics  
vyluma  
ocuphire



Scott Hauswirth, OD  
SCOTT.HAUSWIRTH@CUANSCHUTZ.EDU

scott.hauswirth

## Pain, Photophobia, and Ocular Pathology

Definitions

Central vs peripheral

Dry eye

Treatments

Neurotrophic keratitis

Corneal neuralgia

Corneal neuropathic pain

## Neurotrophic keratitis



## Signs vs. Symptoms

- There is little correlation between signs and symptoms
- Symptoms may correlate with signs
- Most of us treat according to symptoms

## Neurotrophic keratitis

"Some patients look great and feel awful.  
Others look terrible and feel great."  
John Sheppard

## Neurotrophic keratitis

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<https://www.youtube.com/watch?v=EnwXRW7Y9Y>

## Neurotrophic keratitis

“Stain without pain”

“A key differentiator is the reduction or total loss of corneal sensitivity...caused by damage to the corneal nerve, which leads to breakdown and poor healing of the epithelium.”

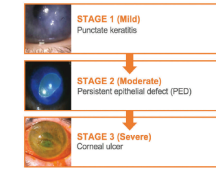
Mastropasqua L, Massaro-Giordano G, Nubile M, Sacchetti M. Understanding the pathogenesis of neurotrophic keratitis: the role of corneal nerves. J Cell Physiol. 2017;252(4):717-724.

<https://knownk.com/about-nk/#what-is-nk>

## Neurotrophic keratitis

NK is a Degenerative Disease<sup>1</sup>

The Mackie Classification Represents One Way to Assess NK Progression<sup>2,3</sup>



- Some vision loss can potentially be seen **in all stages of NK<sup>3</sup>**
- If untreated, **moderate NK progresses to severe disease** with associated risks of **profound vision loss** resulting from scarring and corneal perforation<sup>3</sup>

<sup>1</sup> Smith, David D. Neurotrophic Keratitis. In: Smith, David D. Neurotrophic Keratitis. Elsevier, 2017. 10-15.  
<sup>2</sup> Smith, David D. Neurotrophic Keratitis. In: Smith, David D. Neurotrophic Keratitis. Elsevier, 2017. 10-15.  
<sup>3</sup> Smith, David D. Neurotrophic Keratitis. In: Smith, David D. Neurotrophic Keratitis. Elsevier, 2017. 10-15.

<https://modernod.com/articles/2020-may-june-supplement/neurotrophic-keratitis-new-approaches-to-manage-disease-and-improve-patient-satisfaction?c4src=articleinfinite-scroll>

## Neurotrophic keratitis

	Early/mild severe (e.g., Stage 1)	Moderate (e.g., Stage 2)	Late/more severe (e.g., Stage 3)
<b>Medical management</b>			
Discontinue all preservative-containing topical medications	+	+	+
Topical preservative-free drops	+	+	+
Topical preservative-free gel drops or ointments	+	+	+
Autologous serum drops, human umbilical cord serum, platelet-rich plasma	+	+	+
Recombinant human nerve growth factor (cangeneferin)	+	+	+
Trophic topical preservative-free antibiotics (excluding aminoglycosides)	+	+	+
Matrix metalloproteinase inhibitors	+	+	+
<b>Non-surgical intervention (i.e., office procedures)</b>			
Corneal therapeutic contact lenses	+	+	+
Fresh frozen self-retained amniotic membrane	+	+	+
Bandage contact lens	+	+	+
Synthetic (cyanoacrylate) tissue adhesive	+	+	+
<b>Surgical intervention (i.e., operating room procedures)</b>			
Tarsorrhaphy	+	+	+
Amniotic membrane transplant	+	+	+
Corneal resection	+	+	+

\*Treatments rated as potentially optimal, depending on the patient's individual circumstances

†Treatments rated as potentially appropriate, depending on the patient's individual circumstances (not noted in the manuscript)

Dania, R., Farid, M., Gupta, P.K. et al. Expert consensus on the identification, diagnosis, and treatment of neurotrophic keratopathy. BMC Ophthalmol 21, 327 (2021). <https://doi.org/10.1186/s12886-021-02092-1>

## Neurotrophic keratitis

FEWER THAN  
**65,000 PEOPLE**  
in the U.S. are affected.\*



<https://modernod.com/articles/2020-may-june-supplement/neurotrophic-keratitis-new-approaches-to-manage-disease-and-improve-patient-satisfaction?c4src=articleinfinite-scroll>

## Neurotrophic keratitis

The 20 most expensive pharmacy drugs in the U.S.

Amryt's Myalept takes the top spot while two newcomers enter the GoodRx rankings.

Drug	Company	Price per month (USD)
1. Myalept	Amryt Pharma	7136
2. Enoxet	Horizon Therapeutics	5534
3. Mavencat	EMD Serono	5378
4. Actimmune	Horizon Therapeutics	5277
5. Oxervate	Dompé	4848
6. Takhzyro	Takeda	4564
7. Darigim	Viverra Pharmaceuticals	4505
8. Justapil	Amryt Pharma	4474
9. Cryspe	Takeda	4434
10. Chondral	Regeneron	4370

<https://www.fiercepharma.com/pharma/20-most-expensive-pharmacy-drugs-u-s-2020>

## Neurotrophic keratitis

CVS Pharmacy	\$29,162 retail Save 10%	\$26,182.13 with free coupon	GET FREE COUPON
Walgreens	\$29,162 retail Save 9%	\$26,258.94 with free coupon	GET FREE COUPON
Ralphs	\$29,162 retail Save 15%	\$24,656.73 with free coupon	GET FREE COUPON
Costco	\$29,162 retail Save 12%	\$25,418.76 with free coupon	GET FREE COUPON
Rite Aid	\$29,162 retail Save 10%	\$26,030.99 with free coupon	GET FREE COUPON

<https://modernod.com/articles/2020-may-june-supplement/neurotrophic-keratitis-new-approaches-to-manage-disease-and-improve-patient-satisfaction?c4src=articleinfinite-scroll>

## Monday Morning Patient

Scott Hauswirth, OD

- 71 yo Caucasian female
- 18-month history of dry eye, has seen 8 physicians
- Relatively sudden onset – shortly following uncomplicated cat sx, gradually worsening
- Primary symptoms: constant burning, moderate photophobia
- Treated with Restasis, Xiidra, ATs, Warm compresses, plugs, steroids, LipiFlow
- "NOTHING HELPS!"**



UCHealth

What we expect to see....



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## Neuropathic pain



<https://www.youtube.com/watch?v=ks5QzQdH3I>

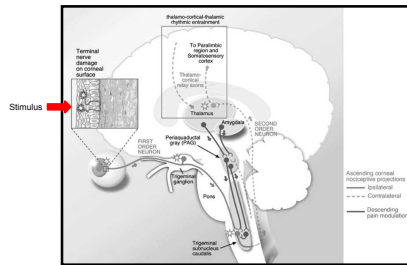
107



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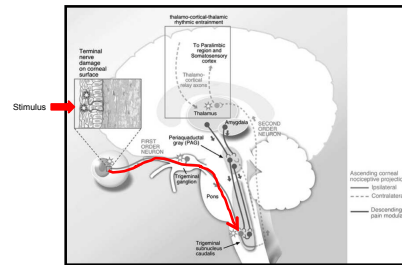
## Central vs peripheral

### Corneal sensory pathway



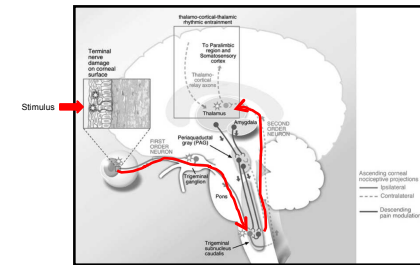
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### Corneal sensory pathway



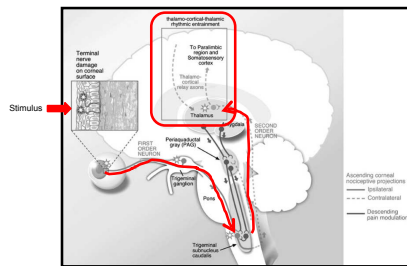
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### Corneal sensory pathway



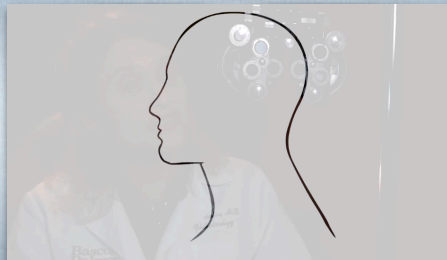
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### Corneal sensory pathway



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## Neuropathic pain

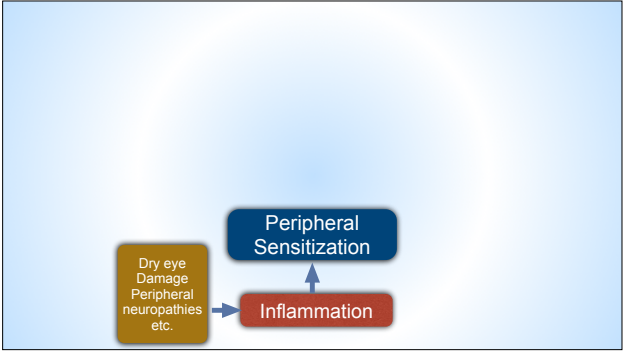


<https://www.youtube.com/watch?v=ks5QzQdH3I>

## Neuropathic pain & dry eye

"damage and inflammation...result in peripheral axonal injuries and the release of...inflammatory mediators, potentially resulting in increased sensitivity of peripheral nerves...(peripheral sensitization)"

Dieckmann G, Goyal S, Hamrah P. Neuropathic Corneal Pain: Approaches for Management. Ophthalmology. 2017;124(118):884-847. doi:10.1016/j.ophtha.2017.08.004



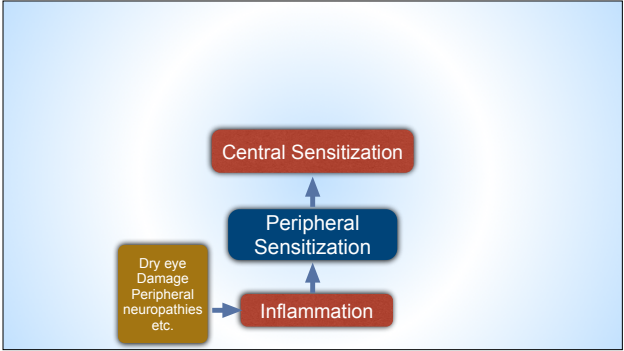
# Neuropathic pain & dry eye

“repeated peripheral nerve injury can lead to central neuronal sensitization”

“Over time...can result in central sensitization... central neurons becoming highly responsive to... pain and heightened pain awareness.”

Dieckmann G, Goyal S, Hamrah P. Neuropathic Corneal Pain: Approaches for Management. Ophthalmology. 2017;124(11S):S54-S47. doi:10.1016/j.ophtha.2017.08.004

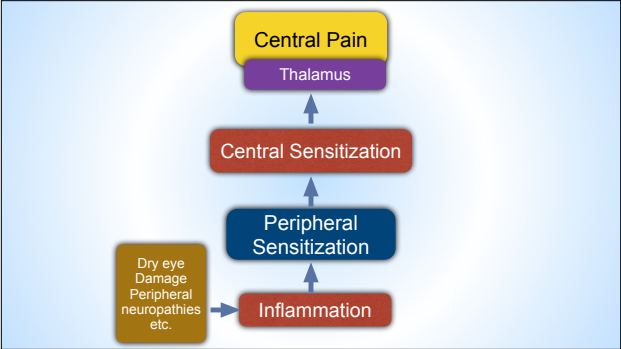
Kim J, Yoon HJ, You IC, Ko BY, Yoon KG. Clinical characteristics of dry eye with ocular neuropathic pain features: comparison according to the types of sensitization based on the Ocular Pain Assessment Survey. BMC Ophthalmol. 2020 Nov 18;20(1):456. doi: 10.1186/s12886-020-01733-1. PMID: 33208127; PMCID: PMC7672944.



# Neuropathic pain & dry eye

“Nociceptors are receptors...for pain perception... connected...to higher-order somatosensory pain pathways and the thalamus, where pain is perceived.”

Dieckmann G, Goyal S, Hamrah P. Neuropathic Corneal Pain: Approaches for Management. Ophthalmology. 2017;124(11S):S54-S47. doi:10.1016/j.ophtha.2017.08.004



# Central pain

[https://www.youtube.com/watch?v=6VZAqNN\\_JoE](https://www.youtube.com/watch?v=6VZAqNN_JoE)

# Central pain

“Moving on up!”

Scott Hauswirth, OD

[https://www.youtube.com/watch?v=6VZAqNN\\_JoE](https://www.youtube.com/watch?v=6VZAqNN_JoE)

# Neuropathic pain & dry eye

“The nerves are plastic”

Scott Hauswirth, OD

[https://www.youtube.com/watch?v=6VZAqNN\\_JoE](https://www.youtube.com/watch?v=6VZAqNN_JoE)

# Tests

## Diagnostic Testing

- Questionnaires
- Aesthesiometry
- BCL testing
- Proparacaine 0.5%
  - Helps to estimate amount of centralization
  - **CAUTION: will also cover up any OSD symptoms!**
- IVCN
  - Presence of neuromas/alterations of SBPN morphology and density

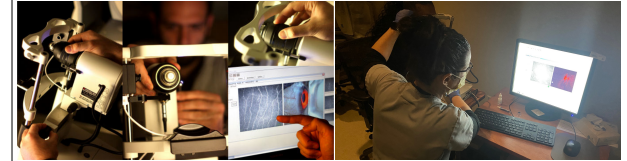
Crane AM et al. Br J Ophthalmol. 2017 101(9): 1238-1243

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## Confocal microscopy

## In-Vivo Confocal Microscopy

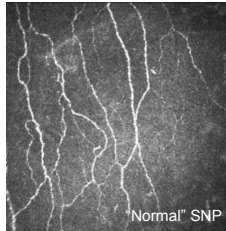
- Uses light rays aligned and focused on a tissue by a condenser lens ("con"-focal)
- Eliminates scattered light from all planes outside focal point
- Allows for multipolar sequential imaging and 3D reconstruction



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## Alterations in corneal nerve morphology

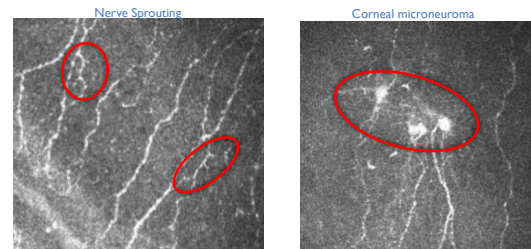
- Decrease in sub-basal nerve plexus density\*
- Increase in nerve tortuosity
- Development of nerve beading
- Thickening of nerve trunks
- Development of corneal microneuromas



Pavali & McCreesh, SJO 2008

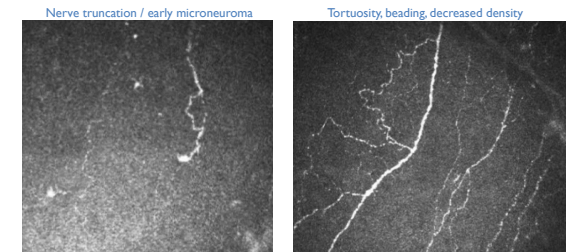
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## Alterations in nerve morphology



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## Alterations in nerve morphology



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## Questionnaires

## OPAS

Qiao Y, et al. Ophthalmology 2016 Jul

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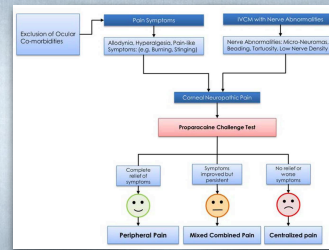
## Proparacaine challenge

## Neuropathic pain & dry eye

“Topical anesthetic may be insufficient to alleviate pain in patients with centralized ocular

Kim J, Yoon HJ, You IC, Ko SY, Yoon KC. Clinical characteristics of dry eye with ocular neuropathic pain features: comparison according to the types of sensitization based on the Ocular Pain Assessment Survey. BMC Ophthalmol. 2020 Nov 18;20(1):455. doi: 10.1186/s12886-020-01735-1. PMID: 33208127; PMCID: PMC7672844.

## Central vs peripheral



7:40

Dieckmann G, Goyal S, Hamrah P. Neuropathic Corneal Pain: Approaches for Management. Ophthalmology. 2017;124(11S):S54-S47. doi:10.1016/j.optha.2017.08.004

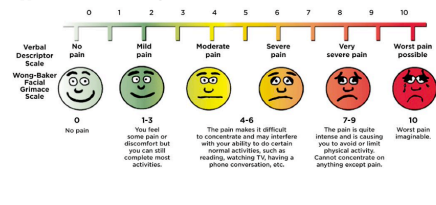
## Proparacaine challenge

1. Baseline pain reading
2. Add drop anesthesia (proparacaine)
3. Wait 90 seconds
4. Proparacaine pain reading

Dieckmann G, Goyal S, Hamrah P. Neuropathic corneal pain: approaches for management. Ophthalmology. 2017;124(11 Suppl):S54-S47.

## Central vs peripheral

Appendix IV: Visual Analogue Scale Questionnaire



Dieckmann G, Goyal S, Hamrah P. Neuropathic Corneal Pain: Approaches for Management. Ophthalmology. 2017;124(11S):S54-S47. doi:10.1016/j.optha.2017.08.004

## Proparacaine challenge

1. Proparacaine reading goes to zero
  1. Peripheral NP
2. Proparacaine reading less than Baseline, but not zero
  1. Mixed Central & peripheral
3. Proparacaine reading = Baseline
  1. Central NP

Dieckmann G, Goyal S, Hamrah P. Neuropathic corneal pain: approaches for management. Ophthalmology. 2017;124(11 Suppl):S54-S47.

## Proparacaine challenge

1. Baseline = 7, Proparacaine = 0
  1. Peripheral NP
2. Baseline = 7, Proparacaine = 2
  1. Mixed
3. Baseline = 7, Proparacaine = 7
  1. Central NP

Dieckmann G, Goyal S, Hamrah P. Neuropathic corneal pain: approaches for management. Ophthalmology. 2017;124(11 Suppl):S54-S47.

## NASA Study

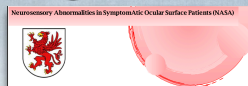
1000 patients

Proparacaine Challenge Test

Participants diagnosed with neuropathic corneal pain with ocular surface discomfort

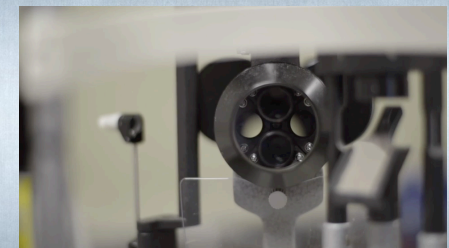
Establish the **prevalence** of neuropathic corneal pain in patients with ocular surface discomfort

<https://clinicaltrials.gov/ct2/show/NCT04836823>



## Co-morbidities

## Neuropathic pain



<https://www.youtube.com/watch?v=ks50QzQcH3I>

## Co-morbidities

“DED, infectious keratitis, recurrent erosions...contact lens wear”

“Anxiety, depression, and post-traumatic stress disorders.”

Dieckmann G, Goyal S, Hamrah P. Neuropathic Corneal Pain: Approaches for Management. Ophthalmology. 2017;124(118):834-847. doi:10.1016/j.ophtha.2017.08.004

## Dry eye

## Co-morbidities

“We believe that patients with signs of DED may also present with symptoms of NCP (neuropathic corneal pain)”

Dieckmann G, Goyal S, Hamrah P. Neuropathic Corneal Pain: Approaches for Management. Ophthalmology. 2017;124(118):834-847. doi:10.1016/j.ophtha.2017.08.004

## Neuropathic pain & dry eye

“tear film instability and persistent inflammation can cause... sensitization...repeated peripheral nerve injury can lead to central... sensitization”

Kim J, Yoon HJ, You IC, Ko BY, Yoon KC. Clinical characteristics of dry eye with ocular neuropathic pain features: comparison according to the types of sensitization based on the Ocular Pain Assessment Survey. BMC Ophthalmol. 2020 Nov 18;20(1):455. doi: 10.1186/s12886-020-01733-1. PMID: 33208127; PMCID: PMC7672944.

## Neuropathic pain & dry eye

“DE symptoms and NOP [neuropathic ocular pain] symptoms were higher in subjects with persistent ocular pain after anesthesia.”

Central pain

Crane AM, Feuer W, Felix ER, Levitt RC, McClellan AL, Sarantopoulos KD, Galor A. Evidence of central sensitization in those with dry eye symptoms and neuropathic-like ocular pain complaints: incomplete response to topical anaesthesia and generalised heightened sensitivity to evoked pain. Br J Ophthalmol. 2017 Sep;101(9):1238-1243. doi: 10.1136/bjophthalmol-2016-309058. Epub 2017 Jan 18. PMID: 28100479.

## NASA Study



1000 patients

Proparacaine Challenge Test

Participants diagnosed with neuropathic corneal pain with ocular surface discomfort

Establish the **prevalence** of neuropathic corneal pain in patients with ocular surface discomfort

<https://clinicaltrials.gov/ct2/show/NCT04838223>

## Neuropathic pain & dry eye

“in our study, 27 out of 33 (81.82%) patients showed mixed sensitization”

Kim J, Yoon HJ, You IC, Ko BY, Yoon KC. Clinical characteristics of dry eye with ocular neuropathic pain features: comparison according to the types of sensitization based on the Ocular Pain Assessment Survey. BMC Ophthalmol. 2020 Nov 18;20(1):455. doi: 10.1186/s12886-020-01733-1. PMID: 33208127; PMCID: PMC7672944.

## Management

## Neuropathic pain



<https://www.youtube.com/watch?v=ks50QzQh3I>

## Neuropathic pain

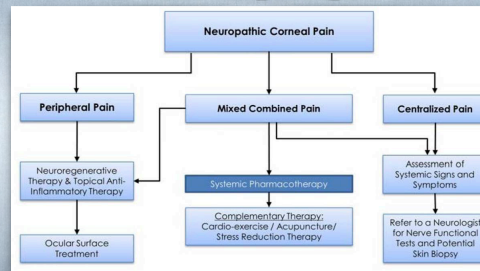


Scott Schachter, OD  
Pismo Beach, CA

<https://www.youtube.com/watch?v=EmeXRW7Y9Y>

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## Central vs peripheral



Diekmann O, Goyal R, Hamrah P. Neuropathic Corneal Pain: Approaches for Management. Ophthalmology. 2027;134(11):854-847. doi:10.1016/j.ophtha.2027.08.004

## Treatment: What to Expect

- **Mild peripheral** cases difficult to differentiate from typical DE discomfort (continuum)
- **Moderate peripheral** cases respond well to combination of neuroregen + DE therapy
- **Centralized** cases (usually with photophobia) will take **several months** to respond
  - May require management with systemic medications
  - May require more intervention with pain management

jkceath

## Neuropathic pain & dry eye

“Control / eliminate inflammation and then use your regenerative therapies. The inflammation is what hypersensitizes the nerves in the first place”

Scott Hauswirth, OD

[https://www.youtube.com/watch?v=6VZAqNN\\_JoE](https://www.youtube.com/watch?v=6VZAqNN_JoE)

## Neuropathic pain & dry eye

“Don’t prescribe stuff that continues to be an irritant to patients - if they don’t tolerate Restasis/Cequa/Xiidra or whatever don’t continue to push it, find an alternative”

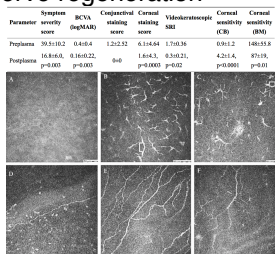
Scott Hauswirth, OD

[https://www.youtube.com/watch?v=6VZAqNN\\_JoE](https://www.youtube.com/watch?v=6VZAqNN_JoE)

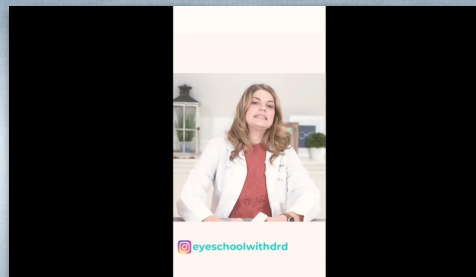
## Autologous serum tears

## Autologous plasma & nerve regeneration

- Rao (Houston) et al. BJO May 2010
- 11 eyes, 6 pts
- Neurotrophic corneas without active disease
  - Punctate keratopathy / persistent epithelial defects included
- Improvements in aesthesiometry
- Increase in mean CND, CNL, CNW, mean # via confocal
- **Complete alleviation in 7, significant improvement in 4**



jkceath



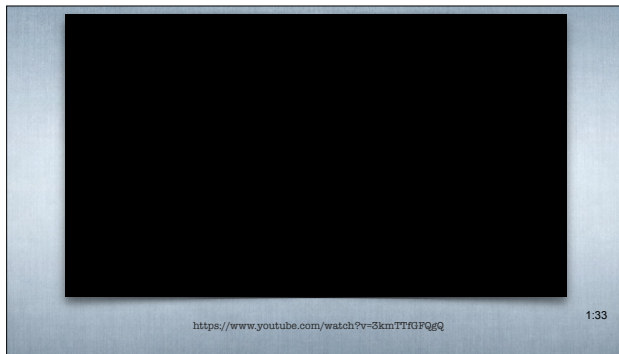
<https://www.youtube.com/shorts/pfAbiYFaWHk>

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VitalTears™

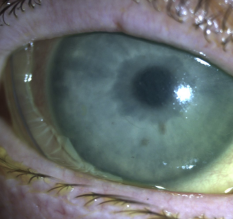


<https://vitaltears.org>



*Clinical Study*  
**Corneal Nerve Regeneration after Self-Retained Cryopreserved Amniotic Membrane in Dry Eye Disease**

- CAM vs. conventional DE Tx
- Reduction in VAS
  - 7.1 to 2.2
- Reduction in SPEED
  - 21.8 to 5.9
- Increase in CND/CNL
  - Baseline: 12,241 +/- 5083 um/mm<sup>2</sup>
  - 3 mo: 18,827 +/- 5453 um/mm<sup>2</sup>
- Improvement in TBUT
  - 8.3 +/- 2.5 to 13.9 +/- 2.2
- Control group showed no change in all parameters




*ucbaath*



**Recombinant NGF**

- Multiple studies support use of NGF to repair damaged nerves
- Oxcervate (Dompe, Italy)
  - FDA approval December 2018 for neurotrophic keratitis
  - 85,000 x 6 weeks
- NGF also important for epithelial cell turnover & migration<sup>1</sup>, LSCN maintenance<sup>2</sup>
- Could it be used to mitigate pain response?



1) Bianco-Mazzeo T, et al. IOVS. 2017 June; 58(6):1068-1072.  
 2) Kishi S, et al. Stem Cells. 2019 Jan;31(1):138-146.

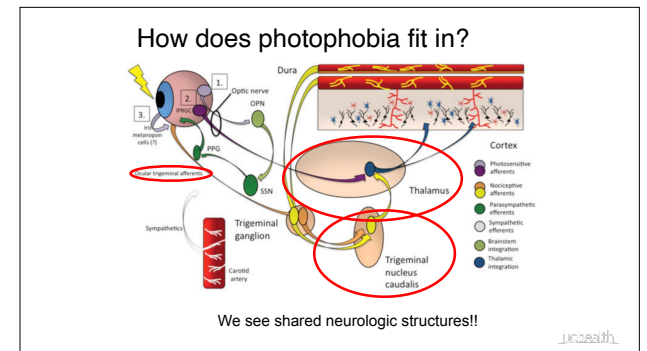
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**Neuropathic pain & dry eye**

Neuropathic corneal pain	Topical	Systemic
1st line	Anti-inflammatories (cyclosporine, lifitigrastr, loteprednol) Neuro-regenerative (Autologous tears) Amniotic membranes	Tricyclic anti-depressants Anti-convulsant
2nd line		Opioid-antagonist (Low-Dose Naltrexone) Opiate analgesics (Tramadol)
3rd line		Gabapentin and pregabalin Duloxetine and venlafaxine Mexiletine
Complementary and Alternative	Cardio-exercise Acupuncture Omega-3 Gluten-free diet Neurostimulation	

Dieckmann G, Goyal S, Hamrah P. Neuropathic Corneal Pain: Approaches for Management. Ophthalmology. 2017;124(118):S34-S47. doi:10.1016/j.ophtha.2017.08.004



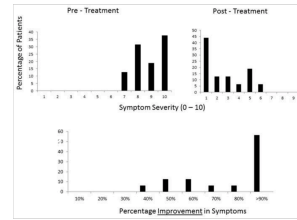
## Neuropathic pain

“[Autologous serum tears] AST restores nerve topography through nerve regeneration, and this correlated with improvement in patient-reported photoallodynia”

Aggarwal S, Kheirkhah A, Cavalcanti BM, et al. Autologous Serum Tears for Treatment of Photoallodynia in Patients with Corneal Neuropathy: Efficacy and Evaluation with In Vivo Confocal Microscopy. *Ocul Surf*. 2015;13(3):250-262. doi:10.1016/j.jtos.2015.01.005

## ASEDs for Photoallodynia

- Decrease in mean severity score (VAS) from **8.8**  $\pm$  1.1 to **1.6**  $\pm$  1.7 ( $p=0.02$ )
- Average interval for improvement in symptom scores was **3.8 months** (1-8 mo)
- 56.8%** patients reported 90% improvement by **6 months**
- Improvement in corneal nerve fiber density
  - 9208  $\pm$  1264  $\mu$ m/mm<sup>2</sup> pre-tx
  - 15451  $\pm$  1595  $\mu$ m/mm<sup>2</sup> post-tx
- Beading and neuromas
  - 93% and 62.5% pre tx**
  - 56% and 7% post tx**



Aggarwal et al. *Ocul Surf*. Jul 2015

ucsf.edu

## Neuropathic pain

“FL-41 filters out certain wavelengths of blue and green. These colors are thought to be particularly bothersome to patients with light sensitivity. By blocking these wavelengths of light, this filter also improves contrast and sharpness which increases visual acuity.”

<https://healthcare.utah.edu/moran/optometry/B41-lenses.php>

## Neuropathic pain

## Neuropathic pain

<https://www.eschenbach.com/products/fl-41-dark-rose-filter-meridian.asp>

## Neurostimulation

## Neurostimulation



Dieckmann, Gabriela, et al. "Efficacy of intranasal neurostimulation for peripheral pain among neuropathic corneal pain patients." *Investigative Ophthalmology & Visual Science* 59.9 (2018): 1806-1806.

## Neurostimulation

“Gateway control theory... [neuro]stimulation...from other nerve fibers can block the [abnormal] nociceptive input delivered to higher centers [central pain]”

Dieckmann, Gabriela, et al. "Efficacy of intranasal neurostimulation for peripheral pain among neuropathic corneal pain patients." *Investigative Ophthalmology & Visual Science* 59.9 (2018): 1806-1806.

## Neurostimulation

“After 3 minutes...71.7% ( $p<0.01$ ) reduction in pain after [neurostimulation]”

Dieckmann, Gabriela, et al. "Efficacy of intranasal neurostimulation for peripheral pain among neuropathic corneal pain patients." *Investigative Ophthalmology & Visual Science* 59.9 (2018): 1806-1806.

## Neurostimulation



Dieckmann, Gabriela, et al. "Efficacy of intranasal neurostimulation for peripheral pain among neuropathic corneal pain patients." *Investigative Ophthalmology & Visual Science* 59.9 (2018): 1806-1806.

## TRP channels

## Corneal Sensory Receptors

Sensation	Soma	Channels	Natural Stimuli	Activators
Touch	Mechano	SA (slowly adapting)	Mechanical forces	Mechanical forces
Pain/Heat	Polymodal	TRPA1, TRPV1, TRPV2, SA ASICs (transient receptor potential, acid sensing)	Noxious Stimuli	Mustard oil, Allicin, Cinnamaldehyde, Capsaicin, Piperene
Temperature	Warm	TRPV3, TRPV4	Moderate temp changes	Vanillin, Thymol
Temperature	Cold	TRPM8	Moderate temp changes	Menthol, Eucalyptol

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## TRP channels

"TRPM8 channels, located on the eyelid and cornea, are cold-sensitive thermoreceptors that play a central role in tear film homeostasis"

<https://aeriepharma.com/rd/ocular-surface-disease/ar-15512/>

## TRP channels

"Increased TRPM8 activity increases basal tear secretion and blink rate"

<https://aeriepharma.com/rd/ocular-surface-disease/ar-15512/>

## TRP channels

"AR-15512 has been shown to increase the activity of corneal cold thermoreceptor nerve fibers and tear production"

<https://aeriepharma.com/rd/ocular-surface-disease/ar-15512/>

## TRP channels

Rohto menthol

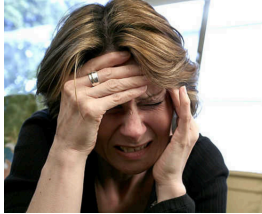


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## Monday Morning Patient

Scott Hauswirth, OD

- 71 yo Caucasian female
- 18-month history of dry eye, has seen 8 physicians
- Relatively sudden onset – shortly following uncomplicated cat sx, gradually worsening
- Primary symptoms: constant burning, moderate photophobia
- Treated with Restasis, Xiidra, ATs, Warm compresses, plugs, steroids, LipiFlow
- **"NOTHING HELPS!!"**



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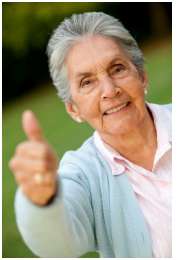
## Monday Morning Patient: Treatment & F/U

- Autologous Serum 50% QID OU (regenerative)
- Pred Forte QID x 1 week, TID x 1 week, BID x 1 week, then QD x 1 week
- Restart Restasis QID OU
- Restart Warm Compress 10-15min once daily
- No systemic medications – low centralization

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## Monday Morning Patient: 3-mo F/U

- Decrease in VAS from 8 to 5
- Decrease in OPAS
  - Notes less sensitivity to wind, light
  - Eyes still generally feel "dry" but more bearable
  - No real "pain"
- Continue without steroids, +Restasis BID OU
- Continue ATs as needed
- Patient is very pleased with her results



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## Tips

- Symptoms are our 'first alert'
- Recognize systemic risk factors: Diabetes, Migraine, Head/neck/spinal issues, Other peripheral neuropathies
- Neurosensory dysfunction likely occurs along a continuum
- Diagnostic clues for neuropathic component include
  - Chronic burning
  - Photophobia/Photoallodynia
  - Hyperaesthesia
- Must first rule out ocular surface disease as contributor – TREAT THE SURFACE!!
- Neuroregenerative therapy critical to improve nerve function
- Psychologic / emotional support critical component
- Comanagement with pain management specialists when necessary

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thank you!

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