

# Effectiveness of a Singular Ocular Rinse via Irrigating Eyelid Retractor to Reduce MMP-9 in Patients with Dry Eye Disease

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# Financial Disclosures

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NM: None



# Eye rinsing has been an effective method to reduce Matrix Metalloproteinase-9 (MMP-9), a hallmark of surface inflammation

BASIC INVESTIGATION

## The Protective Effect of an Eye Wash Solution on the Ocular Surface Damage Induced by Airborne Carbon Black Exposure

Li, Xiangzhe MS<sup>\*</sup>; Kang, Boram MS<sup>\*</sup>; Eom, Youngsub MD, PhD<sup>\*</sup>; Lee, Hyung Keun MD, PhD<sup>†</sup>; Kim, Hyo Myung MD, PhD<sup>\*</sup>; Song, Jong Suk MD, PhD<sup>\*</sup>

Author Information 

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BUY

 Metrics

### Abstract

#### Purpose:


To investigate the effects of an eye wash solution on the ocular surface damage induced by airborne carbon black (CB) exposure.

## Nonpharmaceutical eye wash may reduce Matrix Metalloprotease-9 (MMP-9) in dry eye

Alice Kim; Cameron K Postnikoff; Kelly K Nichols

+ Author Affiliations & Notes

Investigative Ophthalmology & Visual Science June 2020, Vol.61, 100. doi:

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### Abstract

**Purpose :** Past studies have revealed the inflammatory nature of the closed eye environment, and millions of inflammatory mediators are recruited to the ocular surface during sleep. Matrix metalloprotease-9 (MMP-9) has been shown to degrade collagen on the ocular surface when overexpressed. We hypothesize that a

# Eye rinsing has been an effective method to reduce Matrix Metalloproteinase-9 (MMP-9), a hallmark of surface inflammation

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Author Information

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BUY

### Abstract

#### Purpose:

To investigate the effects of an eye wash solution on the ocular surface damage induced by airborne carbon black (CB) exposure.

Frequent, daily, patient-directed eye rinsing

High patient burden

Poor real-world compliance

### Abstract

**Purpose :** Past studies have revealed the inflammatory nature of the closed eye environment, and millions of inflammatory mediators are recruited to the ocular surface during sleep. Matrix metalloproteinase-9 (MMP-9) has been shown to degrade collagen on the ocular surface when overexpressed. We hypothesize that a

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doi:

TOOLS

# Objective

Eye rinsing has been an effective method to reduce Matrix Metalloproteinase-9 (MMP-9), a hallmark of surface inflammation

A **single** ocular rinse assisted via **irrigating eyelid retractor** effect on MMP-9

# Study Design

Randomized Controlled Trial of Patients with Dry Eye Disease & Positive MMP-9 via POC Testing (n=88)

**Device** rinse with  
15mL of irrigating  
solution  
n=46

**Standard** rinse  
with 15mL of  
irrigating solution  
n=42

## Three Hours Post-Rinse

Primary Endpoint: Change in MMP-9 POC Testing  
Secondary Endpoint: Percentage of patients negative MMP-9

## 1 week & 4-12 weeks Post-Rinse

Exploratory EPs: Percentage of patients negative MMP-9 in Device Arm; Results of CDES-Q\*

# Eligibility Criteria

Inclusion Criteria	Exclusion Criteria
<ul style="list-style-type: none"><li>• <math>\geq 18</math> years of age with dry eye complaints</li><li>• Positive MMP-9 via Point-of-care testing</li></ul>	<ul style="list-style-type: none"><li>• Anti-inflammatory medication usage</li><li>• Artificial tear or topical ocular medication usage within the past 14 days</li><li>• Intraocular surgery within the past 6 months</li><li>• Contact lens wear within past 12 hours</li><li>• Contraindication to MMP-9 POC testing</li><li>• Acute allergic or infectious conjunctivitis</li><li>• History of SJS or cicatricial conjunctival disease</li><li>• Severe dry eye preventing wetting of the POC testing</li></ul>

# Baseline Characteristics

	Device Arm (n=46)	Standard Arm (n=42)	Total (n=88)
<b>Sex, n (%)</b>			
Male	10 (22%)	6 (14%)	16 (18%)
Female	36 (78%)	36 (86%)	72 (82%)
<b>Race, n (%)</b>			
White	43 (94%)	40 (95%)	83 (94%)
Age, Mean, (SD), years	47.4 $\pm$ 3.4	45.9 $\pm$ 4.2	46.6 $\pm$ 3.2



# Irrigating Eyelid Retractor

Fixed to a syringe, the retractor has 5 ports which aim fluid at the palpebral conjunctiva, bulbar conjunctiva and conjunctival fornix.



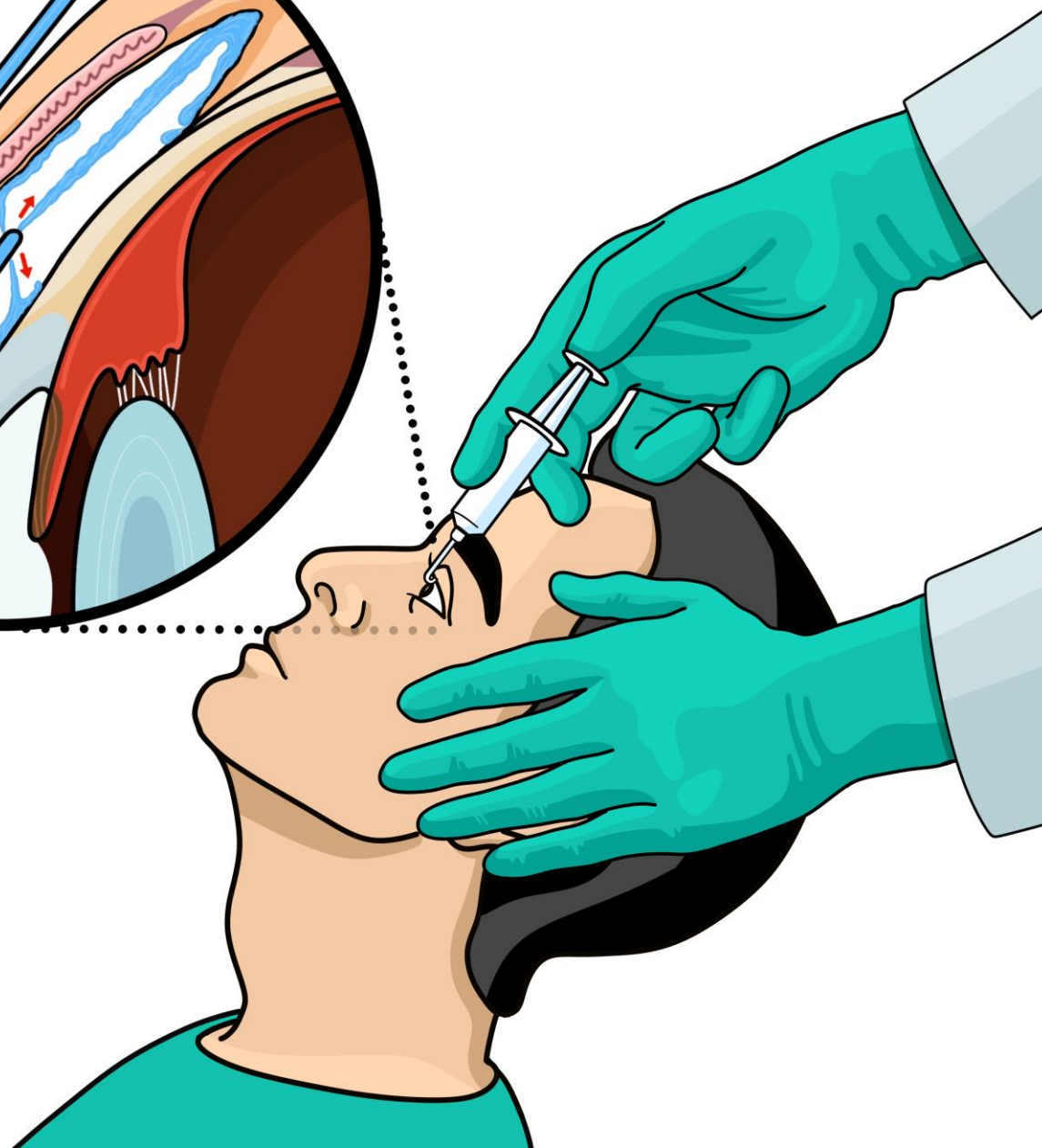
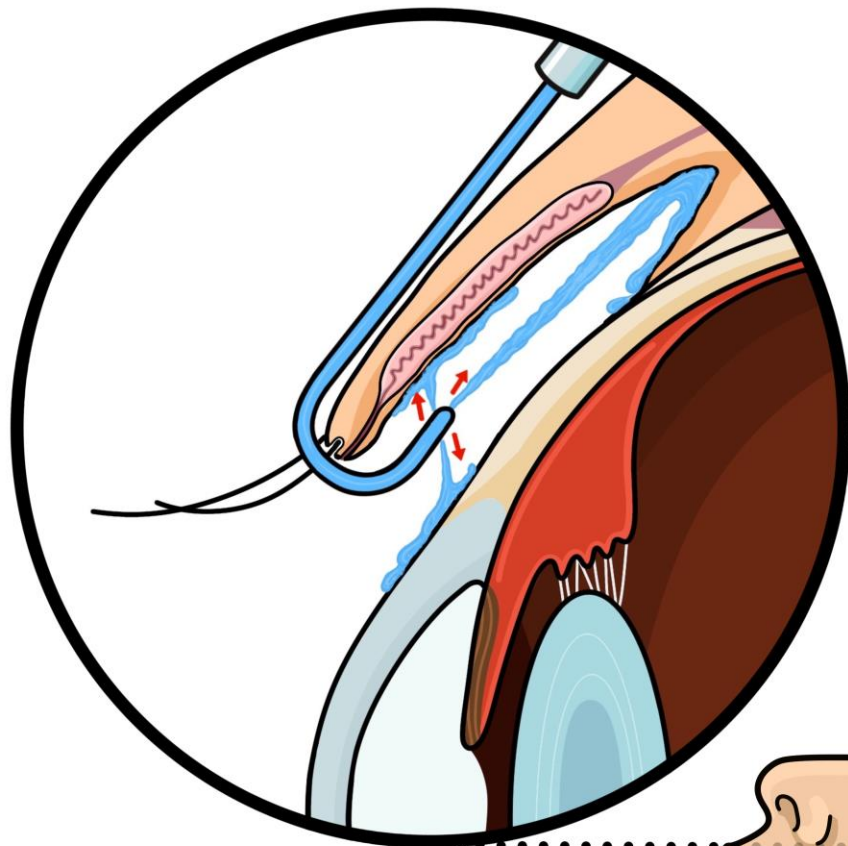


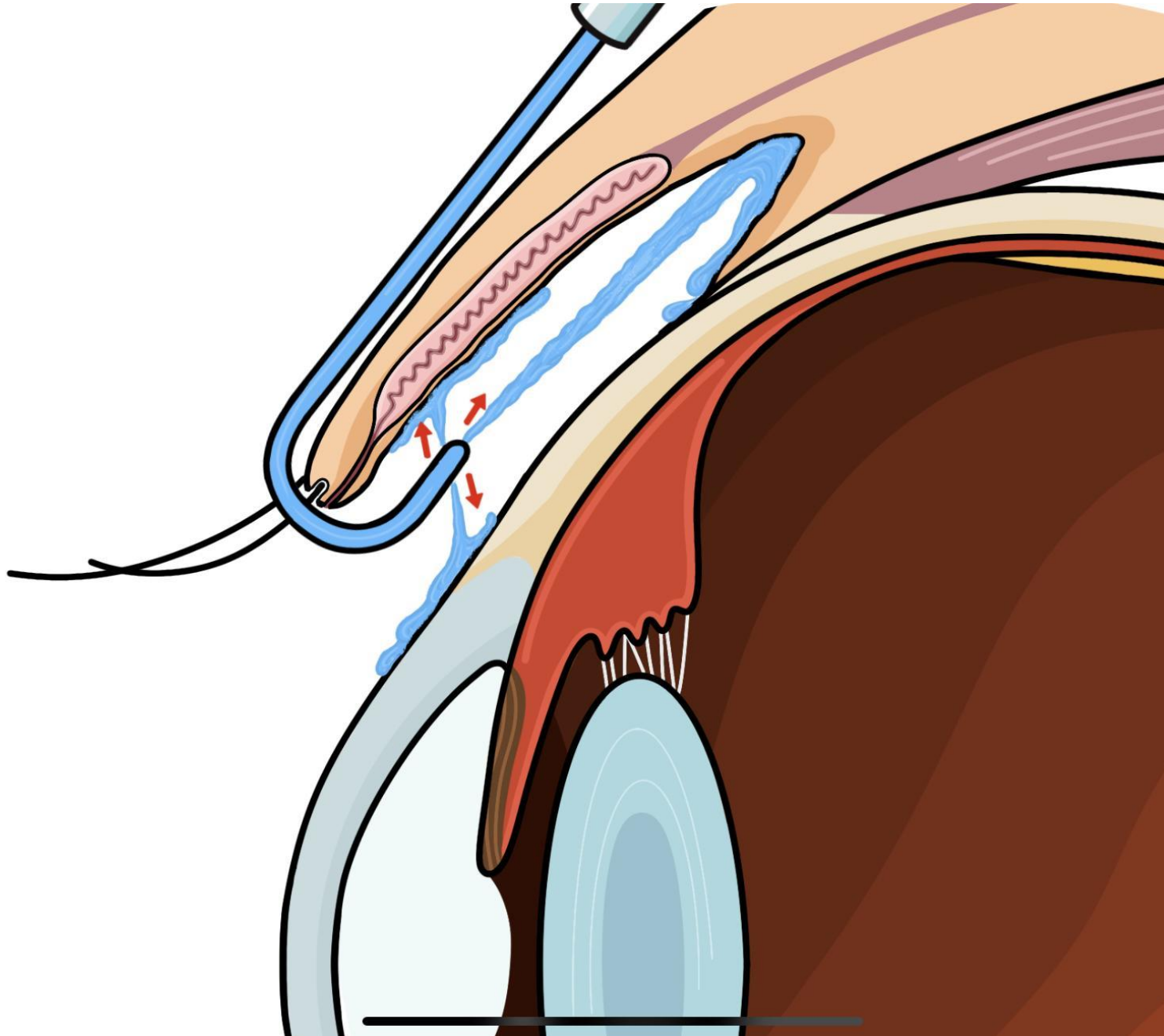
















Standard photographs were obtained at specified time points.

Photographs were randomized, compiled and sent to four blinded graders who graded each image on a 0-4 scale.








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## OPEN Assessment of reliability and validity of the 5-scale grading system of the point-of-care immunoassay for tear matrix metalloproteinase-9

Minjeong Kim, Ja Young Oh, Seon Ha Bae, Seung Hyeun Lee, Won Jun Lee, Yeoun Sook Chun & Kyoung Woo Kim✉

Standard photographs					
Interpretation	Negative	Trace	Weak positive	Positive	Strong positive
Grade	0	1	2	3	4

**Figure 4.** Standard photographs for 5-scale grades ranged from 0 to 4 along to the color density of the red band in the readout window of the point-of-care matrix metalloproteinase (MMP)-9 immunoassay.

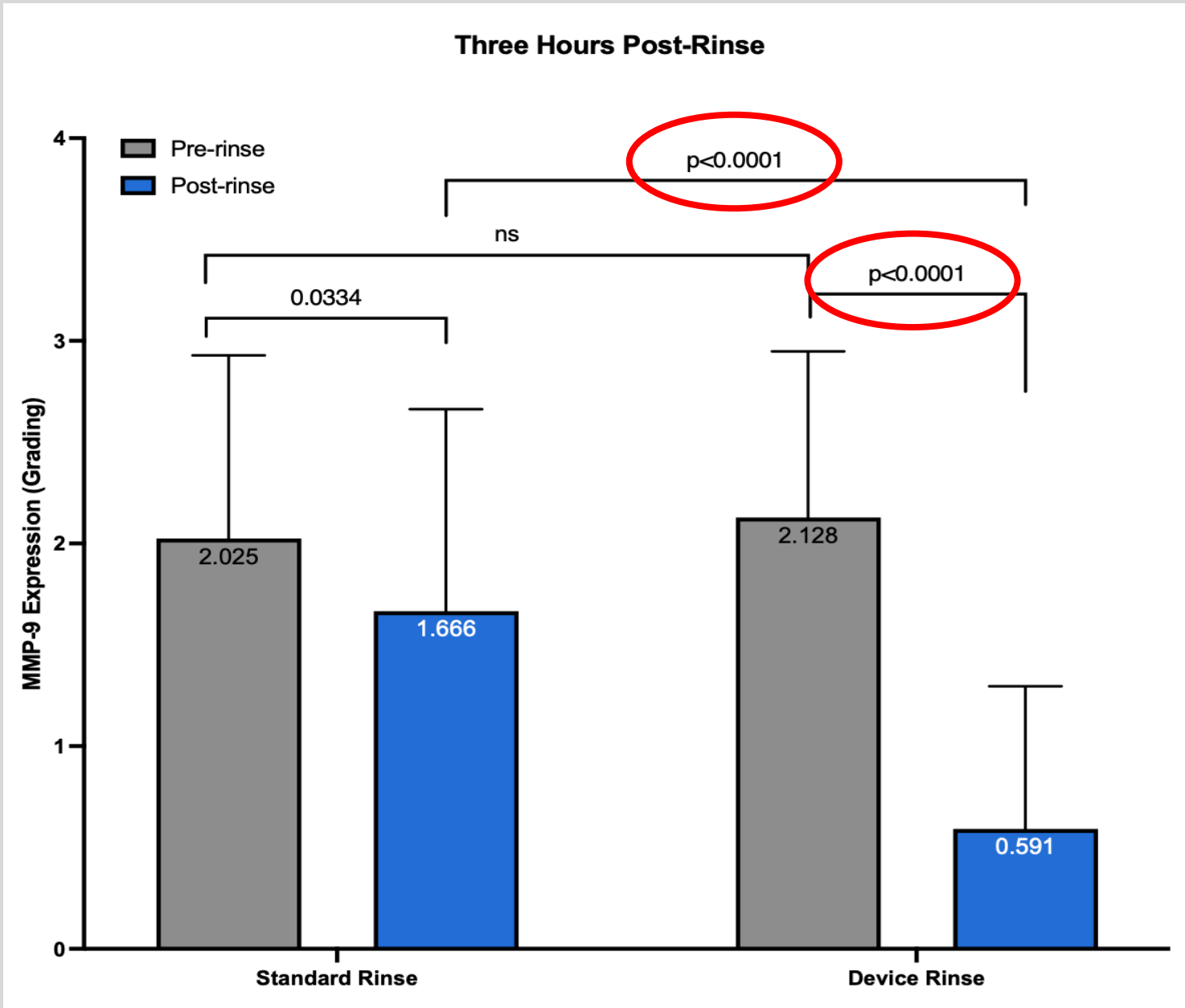




# Results



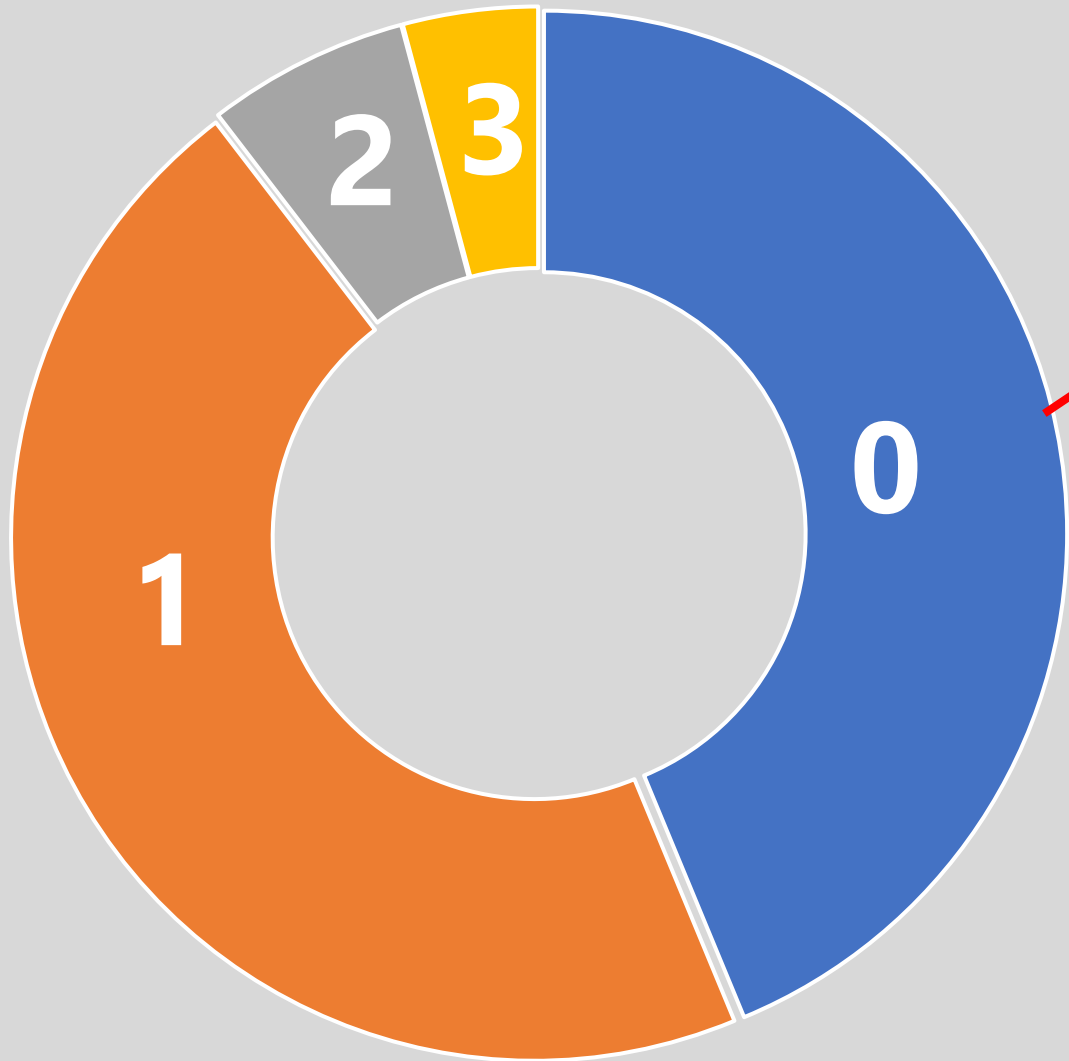
# Results—Primary Endpoint



Paired t-test:  
decreased MMP-9  
expression in both  
standard and device  
groups with greater  
attenuation in the  
device rinse group.

Two-way ANOVA:  
decreased MMP-9  
expression in device  
group compared to  
standard  
( $p < 0.0001$ ).

# Results—Secondary Endpoint



44% of patients converted to negative



# Conclusion

A novel irrigating eyelid retractor rinse of the ocular surface statistically reduces MMP-9 levels compared to baseline and is superior to a standard eye rinse.

Use of an irrigating eyelid retractor may be a therapeutic avenue for those patients with dry eye disease.

Further work on the durability of these findings is ongoing.

