Understanding the Correlation Between Dry Eye Symptoms and Ocular Inflammation

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Introduction

Dry eye is a multifactorial disease. Factors that adversely affect tear film stability and osmolarity can initiate inflammatory mediators that lead to ocular surface damage, including corneal barrier disruption and apoptosis. Approximately 50% of patients with dry eye symptoms have been shown to have inflammatory dry eye.

One of these mediators is matrix metalloproteinase 9 (MMP-9). The Dry Eye Workshop (DEWS) Report defined levels of MMP-9 >40 ng/mL corresponding to moderate-to-severe dry eye disease (1). RPS’s InflammaDry test yields positive results when levels of MMP-9 of 40 ng/mL or more are detected in a tear fluid sample taken from the palpebral conjunctiva.

Methods & Materials

Twenty-seven subjects between the ages of 20 and 74 years old participated in this study. The average age of the participants was 47 years old, with more female subjects than male (19:8), which is reflective of the contrasting prevalence of dry eye between the genders (4). Exclusionary criteria included subjects taking cyclosporine, as medications like Restasis have been shown to reduce levels of MMP-9 in the tears (5).

Test Procedure

Dab the sampling fleece on multiple locations along the palpebral conjunctiva. Adequate saturation occurs when the fleece is dabbed 6-8 times. The fleece should glister and may appear a patchy pink.

Snap the test cassette onto the test body and press firmly to secure.

Immerse the absorbent tip into the buffer vial for a minimum of 20 seconds. A purple fluid wave may be observed moving across the result window at this time.

Read the results. If results are negative after waiting 10 minutes, wait an additional 5-10 minutes before reading the results.

Results

Only 25.9% (7/27) of subjects tested positive. This result was the most surprising, as we found a higher prevalence of elevated MMP-9 levels in a general patient population (63%) in another study we conducted and would have expected even higher correlation in a dry eye population. The average SPEED score of this study’s positive subjects was 8, with primarily female participants (F:M 5:2).

Of those who tested negative (20/27), the average SPEED score was higher at 10, indicating more symptoms with <40 ng/mL MMP-9 levels in the tears. Again, this subset included more female subjects (F:M 14:6).

The SPEED and OSDI questionnaire results were positively linearly correlated, but had weak statistical significance likely due to the small subject sample.

Discussion

InflammaDry is a rapid point-of-care test commonly incorporated into dry eye clinics due to its strong sensitivity to detect inflammation on the ocular surface. A previous study, 2013 Sambursky et al, concluded that InflammaDry showed sensitivity of 85% (in 121 of 143 dry eye patients) and specificity of 94% (59 of 63 healthy controls) (6).

This study found a weak correlation of SPEED (25.9%) to InflammaDry results compared to OSDI (81%) (2). Previous studies had not correlated SPEED to specific inflammatory dry eye signs, but does correlate to corneal staining, meibomian gland score, and meibomian glands yielding liquid secretion score. This study’s results support a persisting disconnect of dry eye symptoms and signs, indicating the importance of clinicians to not rely on symptoms and rule out signs of dry eye, including use of MMP-9 testing.

Conclusion

Previous research has demonstrated the poor correlation between dry eye symptoms and signs. Our results indicate that dry eye symptoms as measured with SPEED don’t strongly correlate with elevated MMP-9 levels, indicating that clinicians should not rely on symptoms alone to prompt MMP-9 or dry eye-related assessments. Additionally, the clinical exam alone may not be appropriate to guide therapeutic decision-making to start an anti-inflammatory treatment or to monitor the impact of treatment.

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References


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