

Contact Lens Update

CLINICAL INSIGHTS BASED IN CURRENT RESEARCH

The eyelids and tear film in contact lens discomfort

February 27, 2019



William Ngo, Head of Biosciences at CORE, received his OD and PhD at the University of Waterloo, and completed a Postdoctoral Fellowship at the University of Alabama at Birmingham. His research interests include disease mechanisms of meibomian gland dysfunction and dry eye disease.

Siddireddy JS, Vijay AK, Tan J, Willcox M. The eyelids and tear film in contact lens discomfort. Cont Lens Anterior Eye 2018;41(2):144-153.

Introduction

There are over 140 million contact lens wearers worldwide and 50% of them experience discomfort while wearing their lenses.^{1,2} Approximately 25% of contact lens wearers experiencing discomfort discontinue wearing their lenses permanently.² Contact lens discomfort has multiple etiologies and the precise mechanism is unknown.³ While it is thought that meibomian gland dysfunction is a driving factor, the conflicting results from multiple studies⁴⁻⁷ suggest that contact lens discomfort is a complex phenomenon. A study by Glasson *et al*,⁸ found a strong relationship between tear stability and tear volume with intolerance to contact lens wear, and another study by Cox *et al*,⁶ found a relationship between eyelid margin features and contact lens discomfort. The purpose of this study was to compare the eyelid features and tear film parameters between individuals who are symptomatic to those who are asymptomatic. This allowed the authors to determine which of these factors were linked to contact lens discomfort.

Methods

This study enrolled 30 habitual full-time contact lens wearers. The participants were divided into two groups: symptomatic lens wearers (Contact Lens Dry Eye Questionnaire-8 score ≥ 12) and asymptomatic lens wearers (CLDEQ < 12). The groups of tests for eyelid margins and tear film parameters that were conducted in the study are summarized in Table 1.

Table 1: Summary of clinical tests for eyelid margins and tear film parameters

| EYELIDS AND LASHES | TEAR FILM PARAMETERS |
|---|--|
| Lid wiper epitheliopathy | Tear meniscus height (TMH) |
| Lid parallel conjunctival folds | Phenol red thread tear volume |
| Palpebral conjunctival roughness and hyperemia | Lipid layer thickness (Johnson & Johnson LipiView) |
| Eyelid margin alteration (hyperkeratinization, telangiectasia, irregularity, posterior margin rounding, erythema) | Tear film evaporation with, and without lens wear |
| Eyelid margin sensitivity | Fluorescein tear stability |
| Demodex mite count | Tear film osmolarity |
| Meibography (meibomian gland dropout) | |
| Meibum quality, volume, expressibility | |

Results

Asymptomatic versus Symptomatic Group Comparison

The authors found that the clinical grading for superior lid wiper epitheliopathy, lid parallel conjunctival folds, meibomian gland dropout, meibum quality, meibum volume, and meibum expressibility were all significantly worse in symptomatic contact lens wearers. The phenol red thread tear volume, tear meniscus height, and tear stability values were all significantly lower in symptomatic wearers. The authors also found significantly higher numbers of superior eyelid *Demodex* mites and increased tear film evaporation rate (both with and without contact lenses wear) in the symptomatic group.

There was no significant difference in tear film osmolarity, tear film lipid layer thickness, and inferior eyelid *Demodex* mite counts between the two groups.

Correlations

With the data from both groups pooled together, the authors found that the superior and inferior eyelid margin sensitivity measures, palpebral conjunctival roughness, superior lid wiper epitheliopathy, and tear evaporation rate were all significantly positively correlated with CLDEQ-8 scores. Tear meniscus height correlated negatively with CLDEQ-8 scores. Tear film evaporation rate with, and without lens wear was negatively correlated with lipid layer thickness.

In the symptomatic group, the authors found that superior lid wiper epitheliopathy, both superior and inferior eyelid margin sensitivity, lid parallel conjunctival folds, meibum quality and expressibility, tear evaporation rate (with and without lens wear), and palpebral roughness were all positively correlated with CLDEQ-8 scores. In the asymptomatic group, CLDEQ-8 scores correlated positively with superior lid wiper epitheliopathy and palpebral conjunctival roughness. In both groups, tear meniscus height correlated negatively with CLDEQ-8 scores.

Discussion

In this study, the authors evaluated eyelid margin and tear film parameters and examined how they were related to contact lens discomfort. The authors postulated that since meibomian gland dropout and meibum quality were

worse in the symptomatic group, there may be a relationship between meibomian gland function and contact lens wear discomfort. The authors also suggested a possible mechanical component to discomfort after having observed a greater amount of lid wiper epitheliopathy and lid parallel conjunctival folds in the symptomatic group. Furthermore, the presence of *Demodex* in higher numbers in the symptomatic group suggested a role of blepharitis in contact lens discomfort. It was also suggested by the authors that symptomatic wearers may not be able to maintain tear film homeostasis with a contact lens inserted, explaining the increased tear film evaporation rate in the symptomatic group.

Overall, there were significant differences in the eyelid margin and tear film parameters between symptomatic and asymptomatic wearers, and the authors believe that more work needs to be done to establish the causal mechanisms driving contact lens discomfort.

REFERENCES

1. Cavanagh HD, Robertson DM, Petroll WM, Jester JV. Castroviejo Lecture 2009: 40 years in search of the perfect contact lens. *Cornea* 2010;29(10):1075-1085.
2. Richdale K, Sinnott LT, Skadahl E, Nichols JJ. Frequency of and factors associated with contact lens dissatisfaction and discontinuation. *Cornea* 2007;26(2):168-174.
3. Nichols KK, Redfern RL, Jacob JT, et al. The TFOS International Workshop on Contact Lens Discomfort: report of the definition and classification subcommittee. *Invest Ophthalmol Vis Sci* 2013;54(11):TFOS14-19.
4. Pucker AD, Jones-Jordan LA, Li W, et al. Associations with Meibomian Gland Atrophy in Daily Contact Lens Wearers. *Optom Vis Sci* 2015;92(9):e206-213.
5. Korb DR, Henriquez AS. Meibomian gland dysfunction and contact lens intolerance. *J Am Optom Assoc* 1980;51(3):243-251.
6. Cox SM, Berntsen DA, Chatterjee N, et al. Eyelid Margin and Meibomian Gland Characteristics and Symptoms in Lens Wearers. *Optom Vis Sci* 2016;93(8):901-908.
7. Machalinska A, Zakrzewska A, Adamek B, et al. Comparison of Morphological and Functional Meibomian Gland Characteristics Between Daily Contact Lens Wearers and Nonwearers. *Cornea* 2015;34(9):1098-1104.
8. Glasson MJ, Stapleton F, Keay L, Sweeney D, Willcox MD. Differences in clinical parameters and tear film of tolerant and intolerant contact lens wearers. *Invest Ophthalmol Vis Sci* 2003;44(12):5116-5124.