Contact Lens Update
CLINICAL INSIGHTS BASED IN CURRENT RESEARCH

The Association Between Meibomian Gland Dropout and Dry Eyes in Contact Lens Wearers

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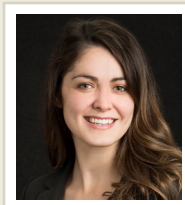

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Introduction

New diagnostic instruments have allowed practitioners to focus on early detection and treatment of meibomian gland (MG) dysfunction. Many practices now routinely use meibography, even for asymptomatic patients. It has been shown that aging and dry eye disease (DED) are correlated to MG structural and functional changes.[1]

The evidence for MG changes with contact lens (CL) wear is equivocal. Some previous studies have found the duration of CL wear is significantly correlated to MG distortion and atrophy, where both morphological and functional changes may become apparent within the first two years of CL wear.[2-4] Ucakhan and Arslanturk-Eren found meibographic changes were statistically significantly worse after three years of CL wear, but then remained stable after seven years.[5] Arita *et al*. reported clusters of MG were found to be shortened, starting with the distal side, and affecting the upper eyelid more than the lower eyelid in CL wearers.[6] One hypothesis for these MG changes relates to the potential for CL wear to cause a 'mechanical insult' to the MGs, although interestingly, there was no difference in MG atrophy between gas permeable and soft CL wearers in this study, perhaps suggesting that the changes found were not likely driven by a material-led mechanical interaction.[6]

Conversely, recent studies have failed to find a clear association between CL use and MG atrophy when examining age- and sex-matched subjects.[7-9] As the effect of CL wear on MG atrophy is still uncertain, it continues to be an important area of ongoing research that has potential implications for clinical practice in both CL prescribing as well as monitoring of MG structure. Further, less is known about early, asymptomatic MG changes in children and young adults. As increasing numbers of young patients are introduced to soft CL wear for vision correction or myopia control, more research has begun to focus on the effect of CL wear on the MGs in this population. This is the case for a new study by Gu *et al*. who examined the relationship between MG dropout and DED diagnosis in a young adult CL wearing population.

Gu, T et al. (2020). Meibomian gland dropout, not distortion, can distinguish dry eyes from normal eyes in contact lens wearers. Current Eye Research, 45(8): 897-903.

Study Design

The study was based in China and was a prospective cohort design. Participants were monthly daily-wear hydrogel CL wearers between the ages of 20-28, who replaced their solution as recommended. Patients who were pregnant, or who had a history of any ocular disease, allergies, or eye surgeries were excluded. Participants who were symptomatic of DED were included in the study, however, the authors attempted to control for the

effect of DED treatments on the MG, so excluded symptomatic DED patients who were already engaged in DED therapies. The study group of 73 CL-wearing participants was compared to a control group of 68 non-CL wearers. It should be noted that unlike other studies, these two groups were not age or sex matched.[7,8] Evaluators monitored symptoms with the Ocular Surface Disease Index (OSDI), non-invasive tear break up time, MG atrophy, number of distorted MG ducts, and corneal fluorescein staining. A novel technique was used to evaluate Meibography: rather than using subjective grading common in other studies, the researchers outlined the area of lost MG by freehand and related that to the total area to denote MG atrophy. The presence of MG duct distortion was established if the morphology was altered by more than 45 degrees in the MG, and the number of distortions was recorded.

Results

Not surprisingly, the study found that for subjects with DED, the OSDI score was significantly higher in CL wearers (21.75 ± 5.50) compared to non-CL wearers (16.68 ± 2.49). For normal subjects without DED, there was no difference in the OSDI score between the CL group (7.45 ± 4.21) and the non-CL group (8.10 ± 3.10). For normal subjects, the CL group had higher MG distortion (5.12 ± 4.11) and atrophy (0.22 ± 0.08), than the non-CL group (1.59 ± 1.04, and 0.15 ± 0.07 respectively). Similarly, for participants with DED, the CL group had a higher degree of MG distortion (5.51 ± 3.15) and MG atrophy (0.29 ± 0.11) compared to the MG distortion (3.83 ± 1.81) and MG atrophy (0.22 ± 0.08) found in the non-CL group. For both normal subjects and those with DED, MG distortion and MG atrophy was higher in the CL group.

However, for the clinician, it is important to consider if these correlations are clinically significant. Can MG distortion or MG atrophy really be used clinically to predict the diagnosis of DED in CL wearers?

To answer this question, the study determined the effectiveness of using MG changes to diagnose DED by applying a receiver operating characteristic (ROC) curve analysis. They utilized the area under the curve (AUC), to interpret if the results were meaningful. An AUC value ranges from 0.50-1.00, with 0.50 showing no significance (relationship is random), 0.51-0.69 represents poor discriminatory power, 0.70-0.90 represents moderate discriminatory power, and >0.90 represents high discriminatory power, and therefore a clinically meaningful relationship.[10] The authors found the effectiveness of using MG distortion to diagnose DED in non-CL subjects gave an AUC value of 0.783, which shows there is an association, but not a clinically significant relationship. Further, MG distortion was ineffective in discriminating DED from normal subjects in the CL group as the AUC dropped to 0.507. The authors also found an association between MG atrophy and DED in the non-CL wearing group (AUC 0.740) and CL wearing group (AUC 0.715), although this did not reach the level of a clinically meaningful difference.

Clinical Implications

Instead of using subjective grading of atrophy, as is common both in clinical practice and in other studies, the authors used a freehand estimation of the total MG atrophy area and compared that to the total area to indicate the MG atrophy. This limits the clinical implications of the study, as the small percentage difference between the groups is unlikely detectable by commonly used subjective grading methods.

This study agreed with other publications[3,6] that showed changes to MG morphology correlated in CL wearers compared to non-CL wearers. It also showed that MG changes are more common in CL wearing subjects than non-CL subjects. However, the authors did not find a clinically meaningful relationship relating MG atrophy to DED in CL wearers. This is similar to other studies that did not find a clinically significant relationship between CL use and MG atrophy.[7-9]

The authors of this study agree that more longitudinal data will be helpful to further investigate the long-term

effects of CL wear on MG atrophy. Recently, Llorens-Quintana *et al.*, 2020, published a preliminary study looking at the impact of daily disposable soft CL on MG morphology over a period of 12 months.[11] They found that over time, changes were apparent in MG atrophy and the number of MG, and these findings were correlated with changes in corneal staining and fluorescein break-up time.[11] However, longer-term longitudinal, prospective studies are needed to investigate these changes over several years.

Non-contact meibography is a relatively new addition to primary eye care practice. As with all new technology, we do not have the longitudinal data to aid in clinical decision-making regarding lens choice or the age to begin CL wear based on meibography alone. However, with this new tool at our disposal, it is up to the individual practitioner to ensure meibography is monitored so the patient may be adequately informed of any MG changes that may occur over time. This study certainly highlights that we must pay close attention to the risk factors for DED in younger populations, so we may prevent future chronic DED, especially in CL wearers.

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