· Clinical Research ·

Comprehensive evaluation of ocular surface parameters in patients with moderate-to-high myopia

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Abstract
● **AIM:** To investigate the ocular surface parameters in patients with moderate to high myopia.

● **METHODS:** This prospective study was conducted in May 2023, enrolling patients with moderate to high myopia (spherical equivalent refraction ≤-3.0 D). After completing the Ocular Surface Disease Index (OSDI) questionnaire, refractive parameters and non-invasive tear film parameters were measured, followed by the Schirmer I test and fluorescein sodium staining. The diagnosis of dry eye disease was based on OSDI score, non-invasive tear breakup time (NIBUT), Schirmer I test, and fluorescein sodium staining results, according to the 2020 Chinese Expert Consensus on Dry Eye. The Mann-Whitney *U* test was used to compare ocular surface parameters between moderate and high myopia, as well as between patients with and without dry eye. Pearson correlation analysis was employed to assess the relationship between the lipid/muco-aqueous layers and tear film parameters. A general linear mixed model (GLMM) was used to analyze the impact of refractive parameters on ocular surface parameters after adjusting for age and sex.

● **RESULTS:** A total of 35 eyes with moderate to high myopia (12 males; mean age, 30.30±5.45y) were included in the study. Among them, 26 eyes were classified as normal and 9 as dry eye. Of the 9 dry eye cases, 7 were observed in the high myopia group (n=18) and 2 in the moderate myopia group (n=17). Among the enrolled patients, those with high myopia demonstrated significantly higher OSDI scores than those with moderate myopia (P=0.0417). Patients with dry eye exhibited significantly shorter interblink intervals (P=0.0081) and higher OSDI scores (P=0.0001) than those without dry eye. Pearson correlation analysis revealed a significant positive correlation between lipid layer thickness (LLT) and tear meniscus height (r=0.395, P=0.023), and a significant negative correlation between the muco-aqueous layer thickness change rate (MALTR) and OSDI score (r=-0.466, P=0.016). After adjusting for age and sex using the GLMM, spherical refraction (SPH, β=-1.802, P=0.048) and axial length (AL, β=2.784, P=0.048) significantly impacted OSDI score. Corneal front astigmatism significantly influenced Schirmer I test results (β=8.377, P=0.024). The difference between central corneal thickness and the thinnest corneal thickness significantly affected LLT (β=-2.294, P=0.026). White-to-white diameter significantly impacted MALTR (β=-81.758, P=0.037).

● **CONCLUSION:** In moderate to high myopia, higher SPH and AL correlate with increased dry eye symptoms, which are associated with muco-aqueous and lipid layer alterations. Corneal regularity and diameter also affect tear film dynamics.
● **KEYWORDS:** myopia; tear film; dry eye; ocular surface
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INTRODUCTION
The Definition and Classification Subcommittee of the Tear Film and Ocular Surface Dry Eye Workshop defines dry eye disease as a multifactorial disease of the ocular surface characterized by the loss of homeostasis of the tear film[1]. Tear film imbalance leads to ocular symptoms, with contributing factors including tear film instability and hypertonicity, ocular surface inflammation and damage, and

neurosensory abnormalities[2]. This balance can be assessed *in vivo* by measuring the temporal stability and spatial uniformity of the tear film, as well as the lipid and muco-aqueous layers[3]. Therefore, accurate information regarding the human tear film and its various layers, as well as their interactions, is crucial for understanding dry eye disease.

Myopia is one of the most common ocular conditions worldwide and is closely associated with factors such as environmental influences, genetics, development, and visual habits[4]. With changes in modern visual habits, the incidence of dry eye disease among patients with myopia has increased, significantly impacting visual health. A study by Zhao *et al*[5] demonstrated that for every 1 diopter (D) increase in myopic refractive error, the risk of developing dry eye disease increases by 0.761 times. Lyu *et al*[6] identified that axial elongation exacerbates dry eye severity and tear film instability in myopia. On the other hand, Ibrahim *et al*[7] found significantly higher dry eye prevalence in high myopic eyes versus non-myopic eyes, with no such difference observed in moderate myopic eyes. With the widespread application of corneal refractive surgery, the exacerbation of postoperative dry eye symptoms can reduce patient satisfaction and visual quality[8]. Greater stromal ablation in moderate to high myopia leads to increased corneal nerve disruption and more severe dry eye symptoms[9-10]. Therefore, a comprehensive preoperative assessment of the tear film in myopic patients, especially those with moderate and high myopia, is essential.

Previous studies evaluating dry eye disease have predominantly focused on patients with low spherical values[11-13]. Moreover, no prior studies have investigated changes in the muco-aqueous or lipid layer of the tear film in myopic patients. To better evaluate tear film stability and dry eye symptoms in patients with moderate to high myopia, this study included myopic patients with a spherical equivalent refraction (SE) ≤-3.0 D. Comprehensive assessments of dry eye parameters were conducted, including tear film stability, tear secretion, and metrics of tear film sublayers. Additionally, the impact of refractive parameters on tear film indicators was analyzed in patients with moderate to high myopia. The aim of this study is to provide reference data for the early prevention and treatment of dry eye disease in the myopic population.

PARTICIPANTS AND METHODS

Ethical Approval This study was designed in accordance with the principles outlined in the Declaration of Helsinki and was approved by the Ethics Committee of the Eye & ENT Hospital of Fudan University (approval number: 2021118-1). All participants provided written informed consent.

Participants Myopic patients who underwent preoperative examinations for refractive surgery at the Eye & ENT Hospital of Fudan University were prospectively recruited for this study in May 2023. To eliminate inter-eye interference, a single eye was randomly selected for inclusion. All enrolled patients underwent routine ophthalmic examinations, including slit lamp microscopy, uncorrected visual acuity, best-corrected visual acuity, intraocular pressure (IOP) measurement and three-mirror lens fundus examination.

The inclusion criteria were as follows: patients aged ≥20y, no soft contact lens use for ≥2wk, no rigid gas-permeable contact lens use for ≥4wk, and with SE ≤-3.0 D. The exclusion criteria were as follows: patients with a history of ocular surgery, progressive corneal ectatic disease, cataract, glaucoma, uveitis, diabetic retinopathy, or other ocular diseases.

Sample size was calculated using Mann-Whitney U/Wilcoxon rank-sum tests module in PASS 2015 (NCSS Statistical Software, Kaysville, UT, USA), with Schirmer I test results as the primary outcome. Based on a previous study, the mean values were 28.1 mm in healthy controls and 6.4 mm in patients with mild-moderate dry eye, with a pooled standard deviation (SD) of 6.6 mm. Assuming a significance level of α=0.05 and a power of 0.90, the required sample size was in a total of 10 participants.

Measurement Methods Patients underwent corneal tomography examination using a rotating Scheimpflug camera system (Pentacam HR; Oculus, Germany) in the dark, with the same experienced operator performing the procedure for all patients. The Pentacam provided corneal morphological parameters, including corneal front steep keratometry (Ks), flat keratometry (Kf), maximum keratometry (Kmax), corneal front astigmatism (Astig), central corneal thickness (CCT), thinnest corneal thickness (TCT), and white-to-white (WTW) diameter. Axial length (AL) was measured using the intraocular lens (IOL) Master (IOL Master 700, Zeiss, Germany), and the average of three measurements was recorded. Spherical power (SPH) and cylindrical power (CYL) were obtained through comprehensive optometry using a comprehensive refractometer. SE=SPH+1/2 CYL.

The Tear Film Imager (TFI, AdOM Ltd., Lod, Israel) is an optical device that uses a small halogen light source to illuminate a broad waveband ranging from 450 to 1050 nm to access the tear film. The light was projected by the illumination optical system toward the anterior surface of the cornea at an angle of -50° to 50° to ensure that the generated image covered a large field of view. The hyperspectral TFI was used to examine broadband reflectance (600 nm bandwidth), providing a single nanometer resolution for assessing the tear film. The following tear film parameters were measured using the TFI: muco-aqueous layer thickness (MALT), muco-aqueous layer thickness change rate (MALTR), lipid map uniformity (LMU), and interblink interval (IBI).

The IDRA ocular surface analyser (IDRA) ocular surface analyzer (SBM SISTEMI, Inc., Torino, Italy) projects white light onto the cornea, reflecting a white fan-shaped observation area on the lower part of the cornea. Automatic interferometry detects the interference color pattern of the lipid layer to determine the average, maximum, and minimum lipid layer thickness (LLT) of the tear film[14]. Using Placido disk projection principles and automated analytical software, the system detects the time and location of the tear film breakup. The analytical software also measures the tear meniscus height (TMH) and automatically calculates the average of five selection points. The following indicators were assessed using IDRA: non-invasive tear breakup time (NIBUT), including first non-invasive tear breakup time (fNIBUT), average non-invasive tear breakup time (avNIBUT), LLT, and TMH. All examinations were completed within 4h on the same day.

All patients completed the OSDI questionnaire between the IDRA and TFI examinations. The Schirmer I test (without anesthesia) was performed after noninvasive tear film analysis. Standard preoperative examinations for corneal refractive surgery followed, including automated and subjective refraction, corneal topography, AL measurement, and non-contact IOP measurement. After 40min of mydriasis, corneal epithelial fluorescein staining was conducted prior to the three-mirror fundus examination. According to the 2020 Chinese Expert Consensus on Dry Eye[15], the diagnosis of dry eye is confirmed if one of the following criteria is met: 1) OSDI score ≥13, NIBUT <10s or Schirmer I test score ≤5 mm/5min; 2) OSDI score ≥13, NIBUT=10–12s or Schirmer I test score >5 mm/5min, and ≤10 mm/5min, and positive cornea/conjunctiva fluorescein sodium staining result (≥5 points).

Statistical Analysis Statistical analyses and plotting were performed using GraphPad Prism 9 (GraphPad Software Ltd., San Diego, California, USA) and SPSS 26.0 (IBM SPSS® Statistics, Chicago, Illinois, USA). Normality testing was conducted using the Shapiro-Wilk test. Continuous variables are presented as the mean±SD for normally distributed data or as the median [25th, 27th percentile] for non-normally distributed data. Moderate myopia was defined as -6.0 D <SE≤-3.0 D, and high myopia was defined as SE≤-6.0 D. The Mann-Whitney *U* test was used to compare tear film parameters between eyes with moderate and high myopia, as well as between normal and dry eyes. The Pearson correlation test was applied to examine correlations between muco-aqueous layer and lipid layer with tear stability and dry eye symptoms. A general linear mixed model (GLMM) was employed to assess the predictive impact of refractive parameters on dry eye indicators, adjusting for age and sex. The independent variables included SPH, AL, Astig, the difference between CCT and TCT (CCT-TCT), and WTW. The statistical significance was set at $P<0.05$.

Table 1 Basic ocular parameters of patients with moderate to high myopia

Parameters	Mean±SD/median [25th, 27th percentile]
Refraction (D)	
SPH	-5.50 [-7, -4.25]
CYL	-0.75 [-1.5, -0.25]
SE	-6.13 [-7.00, -4.63]
AL (mm)	26.11 [25.59, 26.65]
IOP (mm Hg)	15.79±2.99
Corneal keratometry (D)	
Kf	42.43±1.28
Ks	43.6 [42.95, 45.05]
Kmax	44.1 [43.45, 45.6]
Corneal thickness (μm)	
CCT	547 [529, 569]
TCT	543 [525, 561]
WTW (mm)	11.53±0.32

SD: Standard deviation; WTW: White-to-white; SPH: Spherical power; CYL: Cylindrical power; SE: Spherical equivalent refraction; Ks: Steep keratometry; Kf: Flat keratometry; Kmax: Maximum keratometry; AL: Axial length; IOP: Intraocular pressure; CCT: Central corneal thickness; TCT: Thinnest corneal thickness; D: diopter.

RESULTS

Basic Ocular Parameters of Patients with Moderate to High Myopia A total of 35 eyes with moderate to high myopia (12 males; mean age, 30.30±5.45y) were included in the study. Table 1 displays the basic parameters of the eyes included in this study.

Dry Eye Evaluation of Patients with Moderate to High Myopia Among the 35 included eyes, 18 were from patients with high myopia and 17 from patients with moderate myopia. According to the Shapiro-Wilk test, all dry eye evaluation parameters measured were non-normally distributed (all $P<0.05$). Among the enrolled patients, those with high myopia demonstrated significantly higher OSDI scores than those with moderate myopia ($P=0.0417$; Table 2).

Differences in Dry Eye Parameters Between Patients with and Without Dry Eye in Moderate to High Myopia A total of 26 normal eyes and 9 dry eyes were included in the study, with 7 cases observed in the high myopia group ($n=18$) and 2 cases in the moderate myopia group ($n=17$). According to the Mann-Whitney *U* test, the IBI in patients with dry eye was significantly lower than in patients without dry eye ($P=0.0081$), whereas the OSDI score in patients with dry eye was significantly higher than in those without dry eye ($P=0.0001$; Figure 1).

Correlations among Dry Eye Parameters in Patients with Moderate to High Myopia Pearson correlation analysis revealed a significant positive correlation between LLT and TMH ($r=0.395$, $P=0.023$), indicating that a thicker LLT was associated with a higher TMH. Additionally, a significant

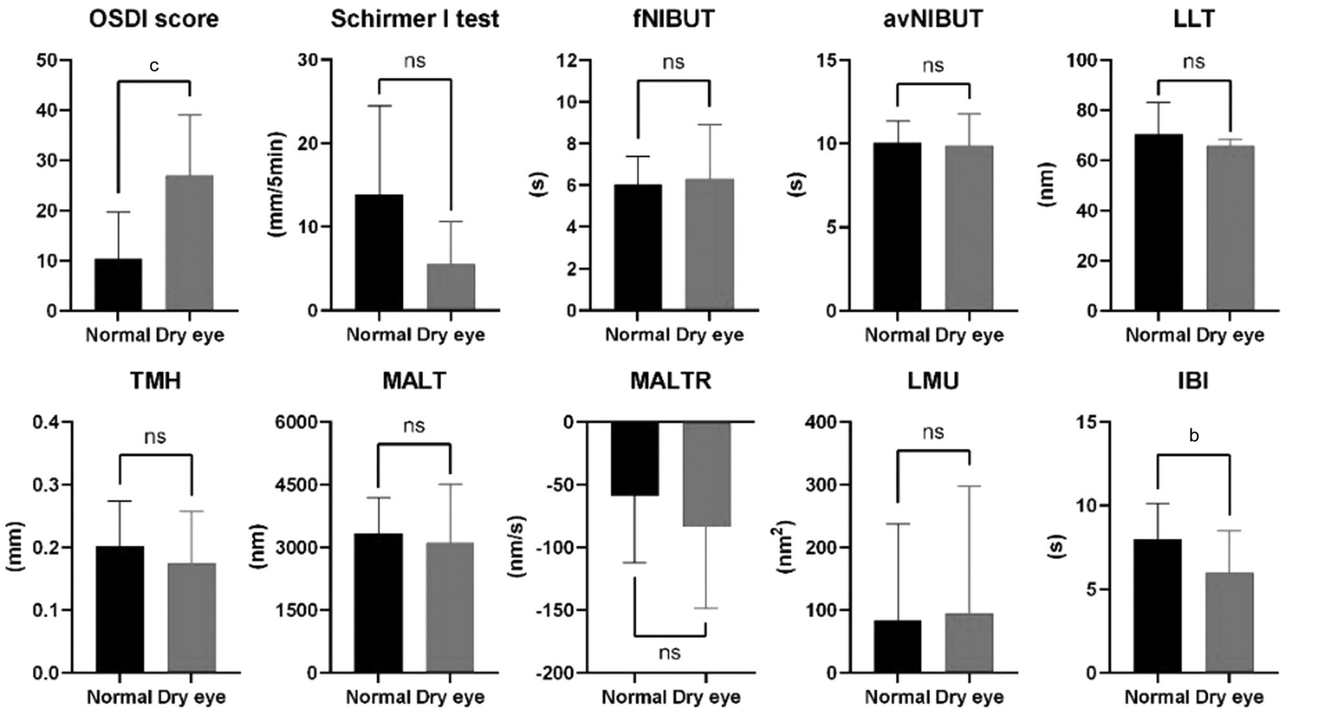

Figure 1 Differences in dry eye parameters between patients with and without dry eye in moderate to high myopia OSDI: Ocular Surface Disease Index; fNIBUT: First non-invasive tear breakup time; avNIBUT: Average non-invasive tear breakup time; LLT: Lipid layer thickness; TMH: Tear meniscus height; MALT: Muco-aqueous layer thickness; MALTR: Muco-aqueous layer thickness change rate; LMU: Lipid map uniformity; IBI: Interblink interval. $^{b}P<0.01$, $^{c}P<0.001$, $^{ns}P>0.05$.

Table 2 Differences in dry eye parameters among patients with moderate and high myopia

Parameters	Median [25th, 27th percentile]			Mann-Whitney *U* test *P*
	All	Moderate myopia	High myopia	
OSDI score	10.42 [6.25, 22.5]	6.82 [5.21, 15]	14.50 [6.82, 23.43]	0.0417
Schirmer I (mm/5min)	9 [4.5, 19]	10 [6, 20]	6 [3.75, 14.75]	0.336
fNIBUT (s)	5.8 [5.04, 6.84]	5.80 [5.28, 7.42]	5.62 [4.88, 6.84]	0.530
avNIBUT (s)	10.16 [9.14, 10.86]	10.22 [9.36, 10.97]	10.10 [8.72, 10.80]	0.564
LLT (nm)	67 [65, 70]	68 [65.5, 69.5]	67 [65, 79.5]	0.941
TMH (mm)	0.18 [0.14, 0.24]	0.18 [0.14, 0.22]	0.18 [0.14, 0.25]	0.901
MALT (nm)	3162.5 [2466.5, 3162.5]	3433 [2794, 4053]	3032 [2336, 3801]	0.347
MALTR (nm/s)	-56 [-114.75, -11.75]	-42.5 [-110.8, -3.5]	-56 [-119.8, -31.5]	0.328
LMU (nm^2)	28 [14, 45]	28 [11.5, 129.5]	23 [14.74, 40.25]	0.851
IBI (s)	6.9 [5.5, 6.9]	7.4 [6.6, 8.48]	6.9 [4.95, 9.25]	0.676

OSDI: Ocular Surface Disease Index; fNIBUT: First non-invasive tear breakup time; avNIBUT: Average non-invasive tear breakup time; LLT: Lipid layer thickness; TMH: Tear meniscus height; MALT: Muco-aqueous layer thickness; MALTR: Muco-aqueous layer thickness change rate; LMU: Lipid map uniformity; IBI: Interblink interval.

negative correlation was observed between the MALTR and OSDI score (r=-0.466, P=0.016), suggesting that a faster MALTR was associated with more severe dry eye symptoms (Table 3).

Influence of Refractive Parameters on Dry Eye Parameters in Patients with Moderate to High Myopia After adjusting for age and sex using the GLMM, SPH (β=-1.802, P=0.048) and AL (β=2.784, P=0.048) significantly impacted OSDI scores, with each 1 D increase in SPH or 1 mm increase in AL elevating OSDI scores by 1.802 and 2.784 points, respectively. Astig significantly influenced Schirmer I test results (β=8.377, P=0.024); each 1 D increase in astigmatism resulted in an 8.377 mm/5min increase in tear secretion. The CCT-TCT had a significant effect on LLT (β=-2.294, P=0.026). Each 1 μm increase in the difference between CCT and TCT resulted in a 2.294 decrease in LLT. The WTW significantly impacted the MALTR (β=-81.758, P=0.037), with each 1 mm increase in WTW leading to an 81.758 nm/s faster MALTR (Table 4).

Table 3 Correlation between tear film sublayer indices and dry eye parameters

Parameters	LLT (nm)		LMU (nm^2)		MALT (nm)		MALTR (nm/s)	
	r	*P*	*r*	*P*	*r*	*P*	*r*	*P*
OSDI score	-0.114	0.527	0.004	0.98	-0.273	0.119	-0.466	0.016
Schirmer I (mm/5min)	0.273	0.169	0.104	0.591	0.366	0.056	-0.412	0.057
fNIBUT (s)	-0.202	0.259	-0.193	0.266	0.17	0.336	0.072	0.725
avNIBUT (s)	-0.025	0.889	-0.171	0.327	-0.01	0.953	-0.085	0.679
TMH (mm)	0.395	0.023	0.106	0.546	0.033	0.852	-0.125	0.543
IBI (s)	0.159	0.392	0.173	0.335	0.1	0.587	-0.169	0.419

OSDI: Ocular Surface Disease Index; fNIBUT: First non-invasive tear breakup time; avNIBUT: Average non-invasive tear breakup time; LLT: Lipid layer thickness; TMH: Tear meniscus height; MALT: Muco-aqueous layer thickness; MALTR: Muco-aqueous layer thickness change rate; LMU: Lipid map uniformity; IBI: Interblink interval.

Table 4 Influence of refractive parameters on dry eye parameters in patients with moderate to high myopia

Parameters	SPH (D)		AL (mm)		Astig (D)		CCT-TCT (μm)		WTW (mm)	
	β	*P*	*β*	*P*	*β*	*P*	*β*	*P*	*β*	*P*
OSDI score	-1.802	0.048	2.784	0.048	-4.514	0.182	-1.114	0.286	-7.896	0.383
Schirmer I (mm/5min)	0.984	0.26	-0.528	0.698	8.377	0.024	-0.425	0.676	0.768	0.934
fNIBUT (s)	0.048	0.732	0.011	0.961	-0.511	0.347	0.041	0.807	1.467	0.154
avNIBUT (s)	0.171	0.13	-0.299	0.084	-0.308	0.493	-0.004	0.978	1.303	0.207
LLT (nm)	0.961	0.284	0.253	0.858	-2.953	0.427	-2.294	0.026	3.786	0.638
TMH (mm)	<0.0001	0.992	0.006	0.526	0.018	0.435	-0.008	0.240	-0.071	0.237
MALT (nm)	61.001	0.469	-172.343	0.176	558.226	0.078	122.304	0.206	-219.131	0.800
MALTR (nm/s)	4.324	0.357	-11.668	0.226	-19.731	0.283	4.597	0.320	-81.758	0.037
LMU (nm^2)	22.884	0.074	-13.732	0.503	-67.690	0.183	-20.478	0.187	27.584	0.848
IBI (s)	0.102	0.616	-0.136	0.662	-0.703	0.339	-0.266	0.217	-0.916	0.632

OSDI: Ocular Surface Disease Index; fNIBUT: First non-invasive tear breakup time; avNIBUT: Average non-invasive tear breakup time; LLT: Lipid layer thickness; TMH: Tear meniscus height; MALT: Muco-aqueous layer thickness; MALTR: Muco-aqueous layer thickness change rate; LMU: Lipid map uniformity; IBI: Interblink interval; SPH: Spherical power; Km: Mean keratometry; AL: Axial length; Astig: Corneal front astigmatism; CCT: Central corneal thickness; TCT: Thinnest corneal thickness; WTW: White-to-white.

DISCUSSION

Myopia and dry eye are prevalent ocular conditions with high comorbidity. Dry eye is a common complication of corneal refractive surgery, associated with corneal sensory loss, neural reflex disruption of tear secretion, and reduced tear production during flap creation or laser ablation, leading to corneal surface damage and varying dry eye symptoms[16-17]. For myopic patients with pre-existing dry eye disease, refractive surgery may worsen symptoms, cause visual fluctuations, and decrease postoperative satisfaction. Hence, a comprehensive dry eye disease assessment before operation is crucial. This study is the first to comprehensively assess dry eye indicators in patients with moderate to high myopia and to evaluate the muco-aqueous layer using the latest TFI technology, offering novel insights for preoperative refractive surgery screening.

This study suggested a potential link between the severity of myopia and ocular surface discomfort, with more pronounced symptoms observed in individuals with higher SE. After controlling for age and sex, both SPH and AL appeared to be contributing factors to increased OSDI scores. These findings align with earlier research indicating a relationship between myopia and ocular surface alterations. Zhao *et al*[5] found that among 144 preoperative refractive surgery patients, those with dry eye had significantly higher refractive errors than those without dry eye. Lyu *et al*[6] demonstrated a negative correlation between Schirmer I test results and AL, as well as SE. The Schirmer I test reflects basal tear secretion, whereas the OSDI captures subjective dry eye symptoms influenced by physiological, psychological, and neurological factors[18]. Both measures indicate worsening dry eye symptoms in high myopia, likely due to increased ocular protrusion and a greater exposure area associated with longer AL[5]. Consistently, the GLMM in this study showed that larger WTW was associated with faster MALTR, indicating increased tear evaporation and reduced tear retention, which lead to lower Schirmer I test results and dry eye symptoms such as dryness, foreign body sensation, and visual fatigue.

According to our study, of the 35 eyes included in the study, 9 were diagnosed with dry eye, with 7 cases observed in the high myopia group (n=18) and 2 cases in the moderate myopia group (n=17). A possible explanation is that high myopia patients tend to engage in prolonged near-work and reduced outdoor activities; increased screen time lowers blink frequency, contributing to the development and exacerbation of dry eye symptoms[19-21]. Fagehi *et al*[11] reported a 36% (9/25) prevalence of dry eye disease in myopic patients, whereas Alanazi *et al*[12] found that 48% (24/50) of myopic patients had dry eye. The difference in prevalence rates may be attributed to the inclusion of patients without recent contact lens use, facilitating tear film stability restoration. As suggested by the studies of Li *et al*[22] and Zhao *et al*[5], wearing contact lenses is a significant factor in reducing tear film stability. This study further supports the association of dry eye with increased symptoms as reflected by higher OSDI scores and tear film instability as indicated by reduced IBI. TFI measures IBI by allowing patients to blink freely during testing[3]. Similarly, Oganov *et al*[23] found that, compared to patients without dry eye, those with dry eye had a significantly reduced maximum blink interval (the maximum time the eyes remain open without blinking). This reduction may be attributed to more frequent and shorter ineffective blinks in patients with dry eye, compensated by a higher blink rate.

We assessed the interaction between the muco-aqueous layer and lipid layer with tear stability and dry eye symptoms in patients with moderate to high myopia. A positive correlation was observed between LLT and TMH, suggesting a potential link between lipid secretion and tear volume. The lipid layer, the outermost part of the tear film, facilitates tear redistribution after blinking and prevents evaporation. Consequently, a thicker LLT correlates with a higher TMH[24]. Li *et al*[25] demonstrated that lower quadrant LLT positively correlated with TMH and negatively with lower eyelid meibomian gland loss, underscoring the lipid layer's role in preventing tear evaporation. Additionally, there was a negative correlation between MALTR and OSDI score. The middle aqueous layer lubricates, cleanses, and nourishes the ocular surface, whereas the mucous layer ensures even distribution of the aqueous layer and maintains surface moisture[26]. A faster MALTR is associated with poorer tear film stability, resulting in more severe ocular irritation symptoms. Mangwani-Mordani *et al*[27] demonstrated that lower MALTR values significantly correlate with reduced IBI, suggesting that individuals with less stable tear films compensate with higher blink reflex frequency[26].

Pentacam is employed to examine the effects of corneal morphology on tear film parameters, as it images the cornea without the tear film when fluorescein staining is absent[28], thereby avoiding confounding from tear film instability[29]. The GLMM results suggested a potential association between greater Astig and enhanced reflex tear secretion, independent of age and sex. In corneas with regular astigmatism, greater astigmatic magnitude may heighten susceptibility to external stimuli such as pressure and dryness, potentially increasing tear secretion *via* neural reflexes. Tears can improve visual quality by filling in the irregularities of the cornea through blinking[30]. Furthermore, Chen *et al*[31] found that astigmatism was not an independent risk factor for dry eye. Additionally, larger disparities between CCT and TCT was associated with reduced LLT, suggesting that corneal asymmetry may influence LLT distribution and stability. Previous research showed that patients with dry eye exhibited higher surface regularity index and surface asymmetry index compared to healthy eyes, aligning with the results of this study[32-34].

A limitation of this study is that it only included a population of healthy individuals with myopia but lacked inclusion of individuals with other eye diseases, such as keratoconus, patients with high or irregular astigmatism as well as more severe stages of dry eye. Future research could expand the sample size and classify the dry eye subtypes of the population studied. Moreover, the effects of age, visual habits and contact lens use on tear film stability in myopic patients remain unexplored; future research should address these factors contributing to dry eye symptoms.

In summary, in patients with moderate to high myopia, higher SPH and longer AL are associated with increased dry eye symptoms, which correlate with the stability of the muco-aqueous and lipid layers. Corneal regularity and diameter influence tear secretion and stability. Therefore, evaluating tear film stability in patients before refractive surgery is essential to predict and prevent postoperative dry eye.

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