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Tear Film Instability in Patients with Irritable Bowel Syndrome: Evidence of a Gut–Eye Connection

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Abstract

Background: The tear film is critical for maintaining ocular surface homeostasis, and its instability is a sign of dry eye illness. Recent research reveals that systemic diseases, especially gastrointestinal disorders like irritable bowel syndrome (IBS), may affect tear film performance via inflammatory and microbiome-mediated processes. Objective: To assess tear film stability in IBS patients and look at any links between gastrointestinal dysfunction and ocular surface changes. Methodology: A cross-sectional study included 56 IBS patients (34 females and 22 males). Tear Film Break-Up Time (TBUT) was assessed using standard clinical procedures

and classified as low (<5 s), moderate (5-10 s), or normal (>10 s). Gender differences and prevalence patterns were investigated using chi-square tests and odds ratios with 95% confidence. Result: Among IBS patients, 48.2% showed reduced TBUT (<10 s), indicating tear film instability. Low TBUT (<5 s) was reported in 12.5% of patients, while 35.7% showed significant instability. There were no significant gender differences (OR 0.89; 95% CI 0.30-2.60; p = 0.83). Conclusion: Tear film instability was observed in over half of IBS patients, lending support to the gut-eye connection concept. These findings underline the importance of multidisciplinary examination of IBS patients, as ocular surface symptoms may be an underappreciated systemic manifestation. Larger controlled research are needed to understand the underlying processes and treatment implications.

INTRODUCTION

The tear film is a highly specialized structure that is necessary for ocular surface health, visual quality, and protection against environmental threats. It is made up of a delicate balance of aqueous, mucin, and lipid components, and disrupting this equilibrium causes tear film instability and dry eye disease (Craig et al., 2017). While the cause of DED is multifaceted, systemic factors are increasingly thought to play a role in predisposing people to abnormal tear secretion and stability.

Irritable bowel syndrome (IBS) is a common functional gastrointestinal condition that causes recurring stomach pain, bloating, and changed bowel habits in the absence of recognizable anatomical abnormalities (Chey et al., 2015). Beyond the gastrointestinal tract, IBS is linked to systemic manifestations such as immune dysregulation, autonomic nervous system imbalance, and gut-microbiota changes (Distrutti et al., 2016). These

systemic changes raise the potential of a gut-eye relationship, in which IBS affects ocular surface physiology.

Recent evidence lends credence to this association. A large case-control study found that IBS patients had considerably lower aqueous tear production and shorter tear film break-up periods than healthy controls, indicating both quantitative and qualitative tear film abnormalities (Aydin et al., 2016). Furthermore, IBS patients reported greater rates of ocular pain and dry eye symptoms, highlighting the potential therapeutic significance of this connection. Experimental studies also suggest that microbiome imbalance and persistent low-grade inflammation, which are common in IBS, may contribute to ocular surface inflammation and reduced lacrimal gland function (Kugadas & Gadjeva, 2016; Li et al., 2021).

Given the increasing recognition of systemic contributions to ocular surface disease, exploring the interplay between IBS and tear film dynamics is of particular clinical interest. Understanding this association may help identify at-risk individuals earlier, guide multidisciplinary management, and open new avenues for therapeutic interventions targeting the gut–eye axis.

METHODOLOGY

This was a cross-sectional observational study carried out at Life Hospital from January to August 2024. A total of 56 participants aged 18 to 55 who had previously been diagnosed with irritable bowel syndrome (IBS) using the Rome IV criteria were recruited from OPD of gastroenterology and medicine.

Patients with a history of ocular surface disease (e.g., dry eye disease, keratoconjunctivitis sicca), ocular surgery or trauma, current contact lens wear, systemic autoimmune conditions (e.g., Sjögren's syndrome, rheumatoid arthritis, lupus), use of

medications affecting tear production (antihistamines, antidepressants, isotretinoin, etc.), and active ocular infection or allergy were excluded. Following informed consent, all subjects got a thorough ocular examination at the Department of Ophthalmology.

After injecting 2 µL of 2% fluorescein dye into the inferior fornix, subjects were asked to blink spontaneously numerous times. A slit-lamp biomicroscope with a cobalt blue filter was used to quantify the time interval between the last blink and the initial sign of a dry patch in the tear film. Three readings were taken for each eye, and the mean value was recorded. A TBUT of <10 seconds was considered abnormal.

The study was authorized by the Ethical Committee of the Life Hospital and carried out in accordance with the Declaration of Helsinki. All subjects gave their written informed consent prior to enrollment. The data were analyzed using SPSS version 26.

RESULTS

A total of 56 IBS patients were investigated, with 34 women (60.7%) and 22 men (39.3%). Over half of IBS patients (51.8%) had a low TBUT (<5 seconds), indicating a high rate of tear film instability in this population. Approximately one-third (35.7%) had moderate TBUT, while only a small proportion (12.5%) had moderate-to-high TBUT, indicating a relatively stable tear film.

TABLE 1. DISTRIBUTION OF TBUT AMONG IBS PATIENTS (N = 56)

TBUT Category	Female (n=34)	Male (n=22)	Total (n=56)	% of Total
Low (<5 s)	18	11	29	51.8%
Moderate (5–10 s)	12	8	20	35.7%
Moderate to High (>10 s)	4	3	7	12.5%

Females showed a slightly higher proportion of low TBUT than males (52.9% vs. 50.0%), although the distribution across categories was generally equal between the sexes. This

shows that tear film instability is widespread in all IBS patients, regardless of gender, with the majority displaying clinically meaningful tear film abnormalities.

A Chi-square test was used to determine the relationship between gender and TBUT categories. The distribution of TBUT was similar between males and females (χ^2 = 0.02, p = 0.99). Females with IBS had slightly lower odds (OR = 0.89) of having reduced TBUT (<10 s) than males, but the relationship was not statistically significant (p = 1.00). This suggests that tear film instability occurs at a comparable rate in both genders among IBS patients.

Overall, 48.2% of IBS patients had reduced TBUT (<10 seconds), indicating that nearly half of the study sample experienced clinically meaningful tear film instability.

DISCUSSION

The current study assessed tear film stability in IBS patients and found that over half (51.8%) had low tear break-up time (TBUT <5 seconds) and an additional 35.7% had moderate TBUT (5-10 seconds). Only a minority (12.5%) had TBUT values in the moderate-to-high range. These findings suggest that tear film instability is common among IBS patients, supporting the idea of a gut-eye axis impacting ocular surface health.

Our findings are consistent with those of Aydin et al. (2016), who demonstrated that IBS patients had considerably lower Schirmer's scores and TBUT than healthy controls. Similarly, dry eye symptoms have been reported to be more common in IBS populations, implying that the condition may predispose to ocular surface dysfunction (Aydin et al., 2016; Kim et al., 2019). Chronic low-grade inflammation, autonomic dysfunction, and gut microbiota dysbiosis, all of which have been linked to IBS and dry eye syndrome, may explain the overlap (Kugadas & Gadjeva, 2016; Li et al., 2021).

Interestingly, in the current study, males and females had similar distributions of tear film instability, with females having a slightly larger proportion of low TBUT. This finding is consistent with previous research suggesting that dry eye is more common in women, probably due to hormonal influences on lacrimal gland activity and tear composition (Stapleton et al., 2017).

However, the overall similarity between genders in our IBS sample shows that IBS may be a more important driver of tear film changes than sex-related variables.

CONCLUSION

The clinical consequences of these discoveries are significant. Tear film instability in IBS patients may lead to eye discomfort, poor quality of life, and possible misattribution of symptoms to primary ophthalmic disease rather than systemic pathology. This emphasizes the significance of a multidisciplinary approach, where gastroenterologists and ophthalmologists collaborate in the therapy of IBS patients, particularly those with ocular problems.

LIMITATIONS

This study has a few limitations. First, the sample size was small (n=56) and limited to patients from a single center, which may have an impact on the data' generalizability. Secondly, we didn't include a healthy control group for a straightforward comparison, which would have enhanced the interpretation of IBS-related effects. Lastly, we exclusively looked at TBUT; including additional criteria as Schirmer's test, tear osmolarity, and ocular surface staining would have resulted in a more comprehensive review.

FUTURE DIRECTIONS

Further research using bigger cohorts, including healthy controls, and incorporating systemic inflammation biomarkers or gut microbiota profiles could help to explain the mechanisms behind the IBS-ocular surface relationship. Furthermore, interventional studies to determine whether IBS treatment (e.g., dietary changes, probiotics, or microbiota-targeted treatments) improves tear film stability would provide important insights into causality and therapeutic potential.

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