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Clinical Evaluation of TeaRx™: A Point of Care Multi-Parameter Tear Film Test for Diagnosis, Stratification, and Prediction of Responsiveness to Cyclosporine A Therapy in Dry Eye Disease

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ABSTRACT

Purpose: To evaluate TeaRx™, a 10-minute, multi-parametric tear test, as a single point-of-care diagnostic device for assessment of dry eye disease (DED), stratifying severity, identifying severe meibomian gland dysfunction (MGD), and predicting patient response to topical cyclosporine A (CysA) therapy.

Methods: A single center, observational, longitudinal clinical study enrolled 593 participants graded by TFOS DEWS II criteria: 495 DED (including 83 with severe MGD), and 98 healthy controls. Tear fluid was collected using a microfluidic tear collection device and analyzed for five biomarkers (lactoferrin, human serum albumin, lysozyme, mucin and IgA) by lateral-flow immunochromatographic assay (LFIA). Optimal logistic regression models were selected for differentiating DED vs. healthy, severe vs. non-severe DED, severe MGD vs. non-MGD in DED patients, and prediction (at baseline) of CysA responsiveness.

Results: Based on the models selected, TeaRx™ differentiated DED (at all severity levels) from healthy controls with 71.5% sensitivity, 63.1% specificity, and AUC = 0.72. Severe DED was differentiated from non-severe DED with 80.6% sensitivity, 66.7% specificity, AUC = 0.77. Severe MGD within DED was identified with 80.6% sensitivity, 61.3% specificity, AUC = 0.80. TeaRx™ predicted CysA responsiveness with 93.8% sensitivity, 63.1% specificity, AUC = 0.86, and NPV = 92.3%.

Conclusions: Based on the results of the current study, TeaRx™ may potentially offer the means for rapid, noninvasive tear biomarker profiling within 10 minutes, providing accurate diagnosis of DED, severity stratification, detection of severe MGD, and prediction of therapeutic response to CysA. These results support its role as a personalized diagnostic platform for optimizing management of DED.

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KEYWORDS
Dry eye disease; tear film; cyclosporine; point of care diagnostics

Introduction

Dry eye disease (DED) is a multifactorial disorder of the tear film and ocular surface characterized by symptoms of discomfort, visual disturbance, and tear film instability, often accompanied by inflammation of the ocular surface.[1,2] Global prevalence estimates suggest that DED affects more than 350 million people worldwide, with increasing incidence due to aging, digital screen use, and systemic conditions.[3,4] Accurate diagnosis of DED remains challenging. Signs and symptoms often correlate poorly, and conventional diagnostic tools such as Schirmer's test, tear break-up time (TBUT), and corneal staining exhibit limited reproducibility and specificity.[2,5,6] Tear film osmolarity and matrix metalloproteinase-9 (MMP-9) assays have improved diagnostic objectivity but remain limited in stratifying severity or guiding therapy.[6–9] Meibomian gland dysfunction (MGD) is the leading cause of evaporative DED, accounting for the majority of moderate-to-severe cases.[10] Severe MGD requires distinct therapeutic approaches, including thermal pulsation or intense pulsed light (IPL), underscoring the importance of accurate subtyping.[10]

Cyclosporine A (CysA) is the most widely used immunomodulatory therapy for DED. While effective in restoring tear film homeostasis, its onset of action is delayed, local tolerability is poor, and adherence is often suboptimal.[11–13] Moreover, only a subset of patients responds favorably. Predictive tools to identify likely responders are urgently needed to optimize treatment pathways and reduce unnecessary use. Tear proteomics offers a rich source of biomarkers reflecting ocular surface health and pathology.[14–16] TeaRx™ (DiagnosTear Ltd., Rehovot, Israel) is a novel lateral-flow multi-parametric assay platform that integrates a microfluidic tear collector with semi-quantitative measurement of tear proteins and cloud-deployed statistical interpretation algorithms.[17] The first-generation assay is based on semi-quantitative determination of lactoferrin (LF),[18,19]

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Human serum albumin (HSA)[15,18] and lysozyme (LYS).[16,18] This assay is approved for *in vitro diagnostic* (IVD) use in the EU, and according to the manufacturers, this assay exhibits >86% sensitivity and specificity for diagnosing severe DED.[17]

DiagnosTear has recently developed a second-generation assay, based on semiquantitative assessment of 5 protein biomarkers: LF, HSA, LYS, mucin (MUC), and immunoglobulin A (IgA).[18–21] Here we report the results of a large longitudinal clinical study, evaluating the five-parameter TeaRx™ test for (a) diagnosing DED at all severity levels; (b) stratifying DED severity; (c) assessment of severe MGD within the DED cohort of patients; and (d) predicting responsiveness to CysA therapy.

Materials and methods

Study design

This was a prospective, single center, observational, longitudinal (4 visits) parallel group, data and tear collection study clinical trial conducted from 2021–2024. Ethical approval was obtained from the LV Prasad Eye Institute Institutional Review Board (LEC-BHR-CT-P-10–20-533), and the study adhered to the tenets of the Declaration of Helsinki. The protocol was also registered in the Clinical Trials Registry-India (CTRI, https://ctri.nic.in/, CTRI/2020/12/029691). Written informed consent was obtained from all participants. Subjects that were identified as eligible DED patients (see criteria below) were treated with artificial tear drops, sodium hyaluronate 0.18% (Sun Pharma, Mumbai, India), Loteprednol etabonate 0.5% (Sun Pharma, Mumbai, India) and/or CysA 0.05% (Sun Pharma, Mumbai, India). The study consisted of a baseline visit, and for DED patients undergoing topical therapy (initiated at baseline), additional 3 follow up visits were conducted at 1, 3 and 6 months. In each visit, on both eyes the benchmark tests were performed (see below) as well as the TeaRx™ dry eye test (see details below) and meibography (Oculus Keratograph 5 M (K5)). Additional auxiliary tests performed at each visit: Osmolarity test (TearLab), Tear Meniscus height (TMH), and Lipid Layer Thickness (LLT, Lipiview)

Participants

A total of 593 eligible participants were recruited: 495 diagnosed with DED according to TFOS DEWS II criteria (Benchmark tests: OSDI ≥13, Tear breakup time (TBUT, Oculus Keratograph 5 M (K5)) ≤10 sec, Schirmer's test ≤10 mm/5 min, and corneal Fluorescein staining score ≥1), and 98 age- and gender-matched healthy controls (all negative in both eyes according to above criteria). Among DED cases, 83 exhibited severe MGD (meibography grade ≥3)).

DED grading

DED grading was based on DEWS II criteria using two parameters (TBUT and Corneal staining (CS)): Grade 0: TBUT ≥10, CS 0; Grade 1: TBUT ≥10, CS 1–2; Grade 2: TBUT ≥10, CS 3–4 or TBUT 2–10, CS 1–2; Grade 3: TBUT 2–10, CS 3 or TBUT <2, CS 1–2; Grade 4: TBUT 2–10, CS 4 or TBUT <2, CS 3–4

TeaRx™ DED assay

Tear fluid was collected using a microfluidic collection device (part of the second-generation TeaRx™ test kit) according to the manufacturer's instructions. Briefly, tear fluid is collected upon application of the device in the lateral canthus. Proper collection is verified by a color change in the micro-capillary tip which is coated with dry fluorescein. The device collects exactly 1 µL of tear fluid which is diluted 1:200 with dilution buffer (an integral part of the device). A drop of 20 µL diluted sample is applied to each one of the 5 sample ports in the test cassettes. In addition, 1 drop of Wash Reagent (supplied with the test kit) is applied to each port, allowing the immunochromatographic reactions to develop for 10 min. Each of the 5 biomarkers tested (LF, HSA, LYS, MUC, and IgA) are semi-quantitatively determined using a digital reader (provided by the manufacturer). Normalized readouts (0.0–2.0 scale, 0.25 intervals) were used as inputs together with the age and the gender of the subjects for statistical analysis (below). Please see Figure 1 for further details.

Assessment of responsiveness to CysA therapy at baseline

Among the eligible DED cohort, 167 patients initiated CysA therapy. Thirty-five (35) met the required criteria for inclusion in the response analysis: (1) eligible DED at baseline, (2) Received CysA treatment without loteprednol etabonate 0.5%, (3) valid follow-up at 3 and/or 6 months. Response was defined as a non-relapsing, ≥1 grade decrease in DED severity.

Statistical analysis

Descriptive statistics

Descriptive comparison of subject-level and eye-level data are presented, for DED cases and healthy controls as well as for cases only, comparing severe MGD vs. non-MGD.

Evaluating the most beneficial diagnostic configuration for presence of DED and severe MGD classification

All analyses were conducted in R (version 4.3.2) using the glmulti package (version 1.0.8). Optimal logistic regression models were selected for associating the semi-quantitative readouts of the 5 proteins, ages and genders of the subjects to the DED and MGD status/severeness, and responsiveness to CysA therapy (all assessed independently). Briefly, a set of 2 demographic variables (age, gender) and 5 studied measures (TearX-LF, TearX-HSA, TearX-LYS, TearX-MUC, and TearX-IgA) were used to create a candidate set of models consisting of main effects and 2-way interactions. An

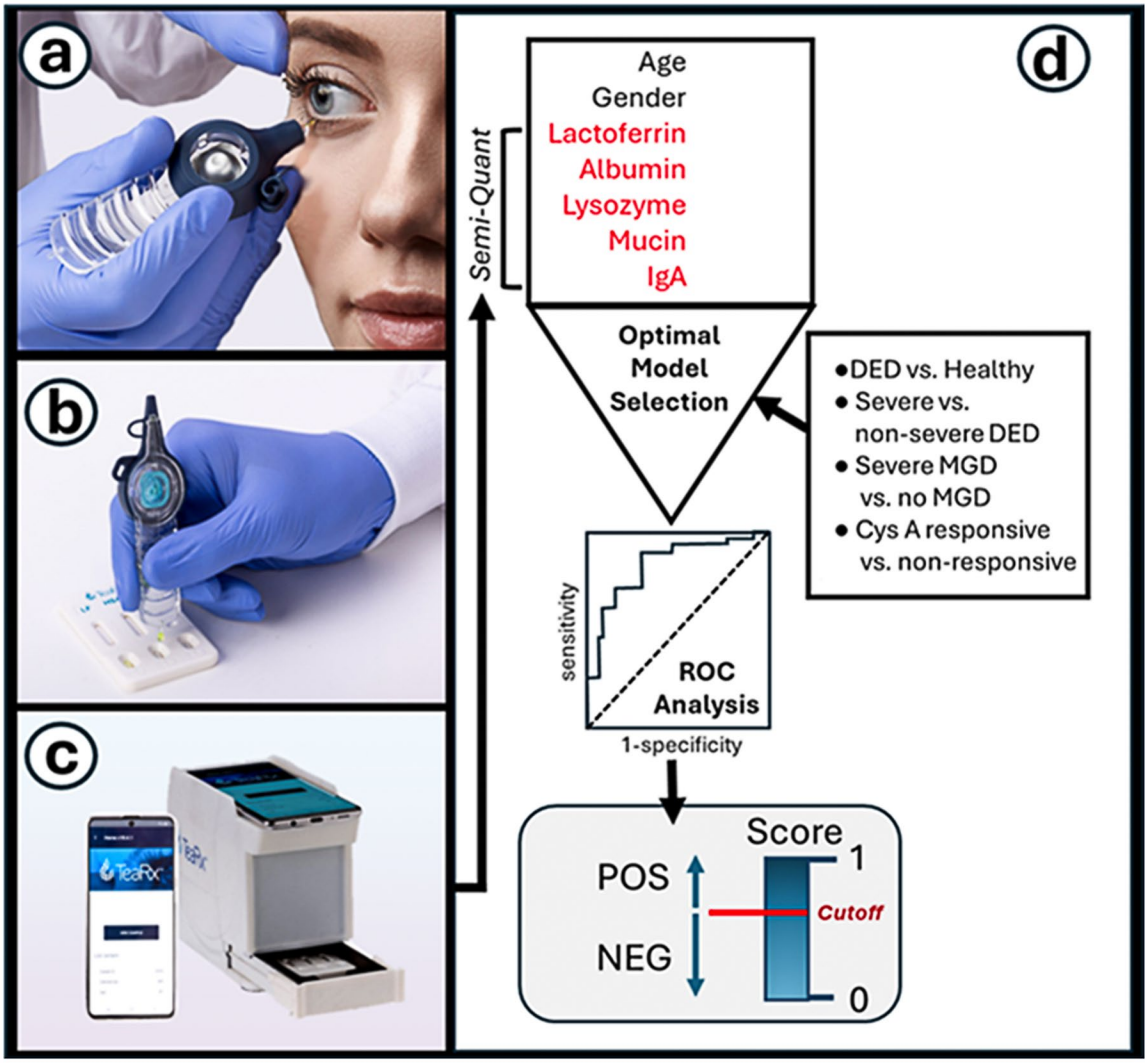

Figure 1. Experimental setup. (a) Collection of 1 uL of tear fluid using the TeaRx™ microfluidic tear collector. (b) Application of the pre-diluted sample to the test cassette. (c) Semi-quantitation of tear protein markers using the integrated digital reader. (d) Statistical workup – semi-quantified markers, age and gender are used as inputs for selection of optimal models to differentiate between the independently-classified cohorts. Optimal models are those that yield the highest AUC at ROC analysis. J-index analysis is used to determine the optimal cutoff for achieving the highest sensitivity and specificity.

all-subset approach was used (testing main effects and 2-way interactions) using the following syntax in R of the glmulti package (the detailed code is available on request) to get a set of the best models in terms of corrected Akaike information criterion (AICc):

> *glmulti.logistic.ded = glmulti::glmulti (ded_01 ~ age + gender + tear_x_lf + tear_x_hsa + tear_x_lys + tear_x_muc + tear_x_iga, data = dxt, level = 2, # test 2-way interactions. method = "g," # genetic approach. crit = "aicc," # AICc as criteria. confsetsize = 1000, # Keep 1000 best models. plotty = T, report = T, # No plot or interim reports. fitfunction = "glm," # glm function. family = binomial, # binomial family for logistic regression. name = "logistic.ded," # The name of this glmulti analysis. intercept = TRUE).*

From the above best set of 2,500 best models, a constraint of hierarchy was implemented. i.e. models with interaction(s) were considered relevant only if the main effects of the said interactions were also included in the model. Among the subset of hierarchical models, the selected model was the one with the best (lowest) AICc. AICc was used as information criteria, as it is better than AIC for small data, and same as AIC for large data. Following model selection, the performance of the model was evaluated using ROC AUC analysis (using the pROC::roc() command in R), and Youden's Index (J-index) to find the optimal combination of sensitivity and specificity. For the above model, Spearman correction coefficient was computed between the predicted probabilities of the selected model and a modified grading.

For the healthy control cohort, a subject was defined as eligible only if both eyes were considered healthy (criteria above). For the DED cohort, for all statistical analyses performed, eyes of the same subject were considered as independent.

Results

The baseline study population characteristics are shown in Table 1.

Table 1. Descriptive statistics of the cohorts in this study as independently classified according to accepted criteria (details above).

Cohort	*n*	Female (%)	Age (years, IQR)
Total enrolled	593	44	41 (30, 52)
DED	495	44	42 (32,53)
Healthy controls	98	42	29 (24, 45)
Severe DED (Grades 3–4)	41	66	47 (36, 56)
Non severe DED (Grades 0–2)	552	43	41 (30, 52)
DED, Severe MGD (Meibograde (3–4)	83	57	49 (38, 57.5)
DED, non-MGD (Meibograde 0)	29	38	37 (30, 49)
DED prescribed with CysA	167	58	46 (31, 56)
Followed up eligible DED patients prescribed with CysA	35	60	44 (31, 53)
Cys A responders (Decrease of ≥1 in DED grade at 3 or 6 months)	16	69	48 (27,53)
Cys A non-responders	19	53	40 (36.5, 53.5)

Diagnostic performance of TeaRx™ to differentiate between DED patients and healthy controls

Eligible DED patients ($n=495$) and Healthy controls ($n=98$) were independently selected according to TFOS-DEWS II classification (see details above). In addition, as clinical management of severe DED differs from non-severe DED, we sought to examine the capability of TeaRx™ to differentiate between these distinct populations. Thus, among the DED cohort, severe DED patients (grades 3–4, $n=41$) were also selected as an independent group and compared to non-severe DED and healthy controls (grades 0–2, $n=552$). All subjects were tested by TeaRx™ at baseline. Semi-quantitative readouts of the 5 tear protein markers, age (numeric) and gender (binary) were used as inputs for selection of optimal logistic regression model for differentiation by means of the highest area under the curve (AUC) in ROC analysis. Optimal threshold was selected using Youden's Index (J-index) analysis. As can be seen in Figure 2, by applying the optimal model and a threshold (cutoff value) of 0.795, TeaRx™ differentiated between DED subjects at all severity levels vs. healthy controls at sensitivity, specificity, and accuracy levels of 72%, 63% and 70.1%, respectively. A different optimal model was selected to differentiate between severe DED (Grades 3–4) vs. non-severe and healthy controls (Grades 0–2). By applying this model and a cutoff value of 0.05, TeaRx™ differentiated between these cohorts at sensitivity, specificity, and accuracy levels of 80.6%, 66.7% and 68%, respectively (Figure 3).

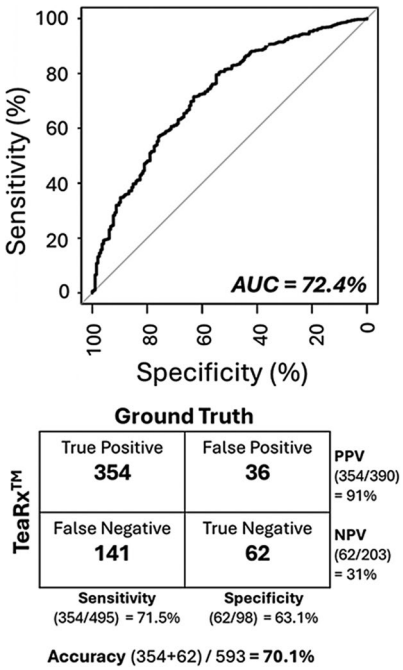

Figure 2. Diagnostic performance of the optimal model selected for differentiation between DED and healthy controls by TeaRx™. Ground truth – Classification of DED according to TFOS-DEWS II.

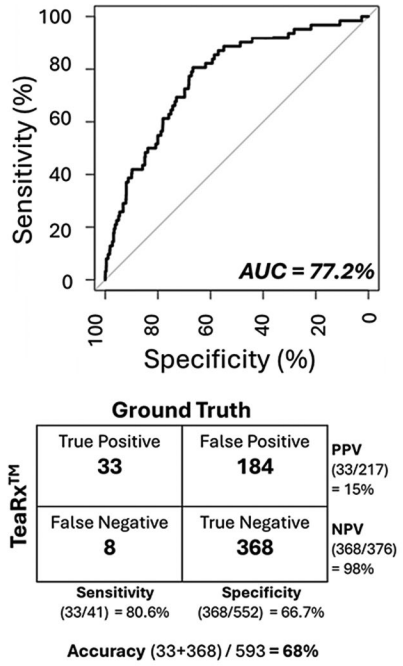

Figure 3. Diagnostic performance of the optimal model selected for differentiation between severe DED (Grades 3–4) and non-severe DED (Grades 0–2) by TeaRx™. Ground truth – Grading of DED according to TFOS-DEWS II using TBUT and CS.

Diagnostic performance of TeaRx™ to differentiate between severe MGD and no MGD in DED patients

Severe MGD requires distinct therapeutic approaches, including thermal pulsation or intense pulsed light (IPL). We therefore sought to examine the capability of TeaRx™ to detect severe MGD in DED patients. In the DED cohort, patients with severe MGD ($n=83$) were independently selected by meibography (meibograde 3–4) and compared to DED patients with no apparent MGD (meibograde 0, $n=29$). Semi-quantitative readouts of the 5 tear protein markers (at baseline), age (numeric) and gender (binary) were used as inputs for selection of optimal logistic regression model for differentiation by means of the highest area under the curve (AUC) in ROC analysis. Optimal threshold was selected using Youden's Index (J-index) analysis. As can be seen in Figure 4, by applying the optimal model and a cutoff value of 0.767, TeaRx™ identified the presence of severe MGD vs.

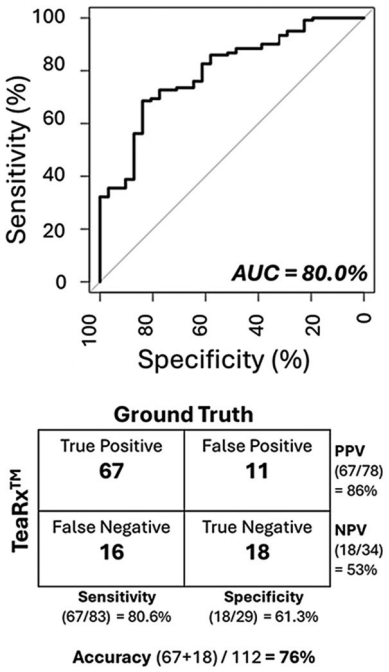

Figure 4. Diagnostic performance of the optimal model selected for differentiation between severe MGD (Meibograde 3–4) and non-MGD (Meibograde 0) in DED patients by TeaRx™. Ground truth – Meibography.

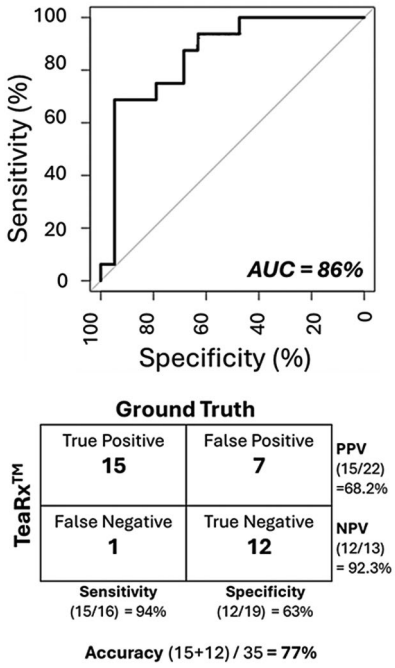

Figure 5. Diagnostic performance of the optimal model selected for differentiation between DED and healthy controls by TeaRx™. Ground truth – Classification of DED according to TFOS-DEWS II.

non-MGD, within the tested cohort of eligible DED patients, at sensitivity, specificity, and accuracy levels of 80.6%, 61.3% and 76%, respectively.

Diagnostic performance of TeaRx™ to predict, at baseline, responsiveness to Cys A therapy

Cyclosporine A (CysA) is the most widely used immunomodulatory therapy for DED. While effective in restoring tear film homeostasis, its onset of action is delayed, local tolerability is poor, and adherence is often suboptimal.[11–13] Moreover, only a subset of patients responds favorably. Predictive tools to identify likely responders are urgently needed to optimize treatment pathways and reduce unnecessary exposure. We therefore sought to examine the capability of TeaRx™ to predict at baseline the clinical outcome of topical Cys A therapy, as evaluated by independent methods. In this study, a total of 167 DED patients were prescribed Cys A at baseline (according to the clinical decision of the ophthalmologist and according to the standard of care). As the onset of Cys A action is delayed, we defined a positive or no clinical outcome at 3 and/or 6 months after initiation of therapy (baseline). Due to low compliance and low therapy adherence (which was expected according to the literature),[11] out of the 167 patients receiving Cys A, only for 35 we had follow-up data at 3 and/or 6 months. Positive responders ($n = 16$) were defined as non-relapsing decrease of at least one DED grade as compared to baseline. Non-responders were defined as patients in which there was no decrease in DED grade, and/or there was a decrease at 3 months which relapsed at 6 months, and/or there was a deterioration (increase in the DED grade). Semi-quantitative readouts of the 5 tear protein markers (at baseline), age (numeric) and gender (binary) were used as inputs for selection of optimal logistic regression model for differentiation by means of the highest area under the curve (AUC) in ROC analysis. Optimal threshold was selected using Youden's Index (J-index) analysis. As can be seen in Figure 5, by applying the optimal model and a cutoff value of 0.309, TeaRx™ could predict CysA responsiveness at baseline at sensitivity, specificity, and accuracy levels of 94%, 63% and 77%, respectively. Notably, the negative predictive value (NPV) was 92.3%, indicating the promising potential of TeaRx™ to identify non-responders before therapy initiation. Interestingly, upon examining the optimal model which was selected in a non-biased manner, the tear protein markers that yielded the highest contribution to the prediction of responsiveness were LYS (Positive correlation), IgA (Positive correlation) and HSA (negative correlation), which are related to innate immunity status, humoral immunity status and existing inflammatory response, respectively.

Discussion

Dry eye disease (DED) remains one of the most frequent yet least consistently diagnosed disorders in ophthalmology. The TFOS DEWS III consensus (2025) reframed DED as "a multifactorial disease of the ocular surface characterized by loss of tear-film homeostasis with ocular symptoms, in which tear-film instability, hyperosmolarity, inflammation, and neurosensory abnormalities play etiological roles."[2] This new framework shifts emphasis from purely symptom-based assessment to identifying pathophysiological drivers, evaporative, aqueous-deficient, inflammatory, and neurosensory, thereby encouraging diagnostic approaches that quantify these mechanisms rather than relying exclusively on

Table 2. Comparison of TeaRx™ to common available diagnostic tools for assessment of ocular surface health, DED and MGD.

Physiological domain	Common tools	Limitations	How TeaRx™ differs
Tear stability	TBUT, osmolarity	Variable, environment-dependent, for osmolarity - compromised sensitivity	Measures protein-level surrogates of stability and homeostasis (MUC, LYS, LF)
Tear liquid production	Schirmer's test	Unpleasant, does not detect common evaporative DED	Measures surrogates of tear liquid production (LF)
Corneal surface integrity	Corneal fluorescein staining	subjective	Measures upstream tear homeostasis (MUC, LF, LYS) and downstream inflammation (HSA)
Inflammation	InflammaDry® (MMP-9)	Binary result, no subtyping, unpleasant sampling, may be affected by non-DED ocular inflammation	Quantifies inflammatory leakage (HSA) and immune activation (IgA, LYS)
Gland structure	Meibography	Complex, costly instrumentation	Detects biochemical signature of MGD (reduced LYS + MUC)
Therapeutic responsiveness prediction	None-available		Predicts CysA response at baseline (AUC 0.86)

patient-reported discomfort.[2]Building on this paradigm shift, the present study was aimed at evaluating a newly introduced investigational diagnostic tool (TeaRx™), as a single point of care device capable of determining the presence of DED at all severity levels, differentiate between severe and non-severe DED, elucidate the presence or absence of severe MGD in DED patients, and predict at baseline whether a DED patient, candidate for Cys A therapy will clinically benefit from such a therapy.

Traditional chair-side tests such as Schirmer's test, TBUT, and corneal fluorescein staining remain widely used but exhibit poor reproducibility and inter-observer variability.[5] Tear osmolarity measurement (TearLab®) introduced a quantitative biophysical endpoint, yet its diagnostic accuracy fluctuates with reflex tearing and environmental humidity.[6,7] In addition, the osmolarity test suffers from a relatively low sensitivity (64%).[22] The InflammaDry® MMP-9 assay provides a rapid measure of ocular-surface inflammation but offers only a binary outcome without distinguishing underlying etiologies, and results may be affected by non-DED-related ocular inflammation.[9] In addition, the InflammaDry® MMP-9 assay requires aggressive touching of the conjunctiva which maybe unpleasant to the patient. Imaging modalities, meibography, interferometry (LipiView®, Keratograph 5 M), and OCT-based lipid-layer analysis, visualize gland structure and tear-film thickness but require costly, non-portable instrumentation and trained personnel.[23,24] Advanced proteomic and metabolomic profiling of tear fluid has identified hundreds of candidate biomarkers,[14–16,18] yet translation into routine practice has been limited by laboratory complexity and absence of standardized reference ranges.

In this technological context, TeaRx™ introduces a novel point-of-care, multi-biomarker approach that operationalizes the DEWS III concept of driver-level assessment. By semi-quantitatively measuring lactoferrin (LF), albumin (HSA), lysozyme (LYS), mucin (MUC), and immunoglobulin A (IgA) from a microliter tear sample, TeaRx™ provides a molecular snapshot across several biological axes reflecting ocular surface homeostasis: (a) LF and LYS: lacrimal-gland secretion and innate antimicrobial defense;[16,18,19] (b) MUC: goblet-cell integrity and mucin-layer stability;[20] (c) IgA: mucosal immune balance;[21] and, (d) HSA: inflammatory-related vascular hyper-permeability.[15,18]

Integrating these signatures through logistic-regression algorithms yields a composite tear-film health index capable of distinguishing DED from healthy (AUC = 0.72), differentiating severe from non-severe cases (AUC = 0.77), identifying severe MGD on top of DED (AUC = 0.80), and predicting CysA responsiveness at baseline (AUC = 0.86). To the best of our knowledge, no currently-available point-of-care device combines diagnostic and predictive functionality within one assay.

In this regard, TeaRx™ is well aligned with the DEWS III guidelines and with the clinical practice. DEWS III calls for diagnostic systems that identify the dominant driver of disease in each patient.[2] TeaRx™ addresses this by simultaneously sampling markers from the aqueous, mucinous, and inflammatory layers, effectively mapping to the evaporative, aqueous-deficient, and inflammatory drivers defined by the consensus. Consequently, the test enables driver-informed therapy selection, facilitating precision management rather than empirical escalation.

Table 2 below describes main ocular surface and DED physiological domains, the common tools for assessment, their limitations, and how TeaRx™ differs. The TeaRx™ platform requires 1 µL of tear fluid to be collected, reducing reflex tearing, increasing the chance to collect tears from severe dry eye patients (i.e. that present with low-none reflex tearing secretion) and improving repeatability. Results are generated by lateral-flow immunochromatography and interpreted *via* an integrated algorithm accessible from any mobile device or laptop. According to the manufacturers, the end-user cost for the disposable cassette and the microfluidic tear collector (<USD 25) make the technology deployable in optometric and community-care settings, extending access beyond tertiary centers. Assuming the high cost of topical immunomodulatory therapies and IPL or thermal pulsation therapies, and in view of the limited outcomes, observed only in a subset of the treated patients, such a tool, potentially capable of pinpointing optimal candidates for IPL or thermal pulsation therapy (i.e. DED and severe MGD), and predicting at baseline positive outcome for long-term Cys A therapy, offers a plausible highly cost-effective means for optimal patient management.

Limitations of this study include its single-center design and a modest CysA cohort ($n = 35$). In addition, we have noticed that the healthy controls cohort is not perfectly age-matched to the DED cohort (median age 29 vs. 42, respectively). However, this bias is accounted for in the model selected. In addition, the optimal models selected in this study need to be validated across multi-ethnic populations and in real-world practice environments. Integration with AI-based analytics could further refine driver identification, and

expansion of the biomarker panel to include cytokines (IL-6, IL-8, TNF-α) or neurosensory mediators could enhance diagnostic granularity. Moreover, applying the same platform to allergic conjunctivitis, ocular GVHD, and diabetic keratopathy could establish a universal tear-film diagnostic toolkit.

Conclusions

Based on the results of this explorative study, and pending future validation on a separate cohort of subjects, we conclude that the TeaRx™ technology may be used (a) as a single point-of-care diagnostics for assessment of DED (b) for differentiating severe and non-severe DED cases, (c) for predicting cases of severe MGD in DED pre-diagnosed patients, (d) for effective selection of patients for CysA therapy, and in general (e), for proper selection of DED therapeutic alternatives based on the underlying etiology and the severeness of the disease. In summary, TeaRx™ has the potential to embodies the TFOS DEWS III vision of driver-specific, precision diagnostics. It may merge the accessibility of point-of-care testing with the depth of multiplex molecular profiling, enabling clinicians to diagnose, stratify, and guide therapy within a single patient visit, a practical realization of precision medicine for the ocular surface.

Author contributions

CRediT: **Sayan Basu**: Conceptualization, Investigation, Methodology, Project administration, Resources, Supervision, Writing – review & editing; **Shimon Gross**: Conceptualization, Data curation, Formal analysis, Writing – original draft; **Amos Sommer**: Conceptualization, Formal analysis, Methodology, Project administration, Resources; **Avital Beck**: Project administration, Supervision, Validation, Writing – original draft.

Disclosure statement

The authors Shimon Gross, Amos Sommer, & Avital Beck are employees of DiagnosTear Ltd., Rehovot, Israel the company that owns the proprietary rights over the TeaRx™ device.

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