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"Lacrinova Experience": results from a multicenter Italian data collection involving more than 3,200 eyes of patients with dry eye disease

ABSTRACT

Purpose: *To evaluate the efficacy and tolerability of Lacrinova eye drops, a hypo-osmolar artificial tear containing hyaluronic acid and riboflavin, in patients with dry eye disease..*

Methods: *This was a multicenter observational study conducted from August 2024 to April 2025, involving 57 ophthalmologists across Italy. Patients with a diagnosis of dry eye disease were enrolled, underwent a baseline evaluation, and were prescribed Lacrinova eye drops at a dosage of four instillations per day. After 90 days of treatment, a follow-up visit was performed to reassess the patients' clinical condition. The evaluated clinical parameters included symptoms such as photophobia, foreign body sensation, difficulty with screen use, and night driving, as well as signs including visual acuity, tear break-up time (BUT), and fluorescein staining. A standardized questionnaire was also administered to assess tolerability, treatment adherence, and perceived efficacy.*

Results: *A total of 1,602 patients (658 men and 944 women), corresponding to 3,204 eyes, were enrolled. The results showed a significant improvement in the main reported symptoms, including light sensitivity (mean score change Δ 2.58, −56.08%), foreign body sensation (mean score change Δ 3.25, −61.66%), difficulty with screen use (mean score change Δ 2.75, −62.64%), and night driving (mean score change Δ 2.09, −57.10%). Objective improvements were also observed in visual acuity (Δ right eye 0.39 decimal units, +4.25%; Δ left eye 0.39 decimal units, +4.24%), BUT (Δ right eye 2.64 seconds, +22.29%; Δ left eye 2.53 seconds, +21.55%), and fluorescein staining. The satisfaction questionnaire revealed high levels of tolerability (mean score 9.01) and adherence (mean score 8.73) to treatment, with similarly high scores for perceived efficacy (mean score 8.83).*

Conclusion: *Lacrinova eye drops proved to be an effective and well-tolerated treatment for the management of patients with dry eye disease. The improvement in symptoms and clinical signs, together with the high level of patient satisfaction, suggests that Lacrinova eye drops may represent a valuable support in daily clinical practice for the treatment of dry eye disease.*

Keywords: *Lacrinova, Dry eye disease, Hyaluronic acid, Riboflavin*

Introduction

Dry eye disease (DED) represents one of the most widespread and complex conditions in modern ophthalmology, with a significant impact on patients' quality of life. According to the TFOS DEWS III definition, DED is "a multifactorial, symptomatic disease characterized by a loss of homeostasis of the tear film and/or ocular surface, in which tear film instability and hyperosmolarity, ocular surface inflammation and damage, and neurosensory abnormalities are etiological factors" [1]. Several risk factors have been associated with DED, including individual factors, systemic diseases, environmental factors, the use of topical and systemic medications, and intrinsic ocular factors. The prevalence ranges from 5% to 50% of the general population, reaching up to 75% among adults older than 40 years [2]. DED can be classified into two main categories: evaporative and aqueous-deficient dry eye [1]. The diagnosis of DED is based on the presence of subjective symptoms, which can be assessed using questionnaires such as the Ocular Surface Disease Index (OSDI), together with objective alterations of the ocular surface, including reduced tear film break-up time (BUT), corneal fluorescein staining, and increased tear film osmolarity [1,3].

The main treatment strategy for dry eye disease (DED) is based on the use of tear substitutes. However, some forms of DED are often difficult to manage successfully, and a subset of patients report persistent symptoms despite the use of conventional artificial tears [4].

To address these unmet clinical needs, Lacrinova was developed as an innovative, patented eye drop formulation based on Ribohyal, an original molecule resulting from the combination of vitamin B2 (riboflavin) and hyaluronic acid. This novel combination, unprecedented in ophthalmology, led to the granting of an international patent. Ribohyal preserves and enhances the properties of hyaluronic acid, such as viscoelasticity, hydration, and mechanical protection, while integrating the antioxidant, photoprotective, and regenerative capabilities of riboflavin [5]. Lacrinova, administered as a liquid eye drop, transforms into a thin gel upon contact with the ocular mucosa, thereby allowing prolonged residence on the ocular surface and promoting intense and long-lasting hydration without causing visual blurring; vision remains clear from the first moments after instillation. These characteristics make the product particularly

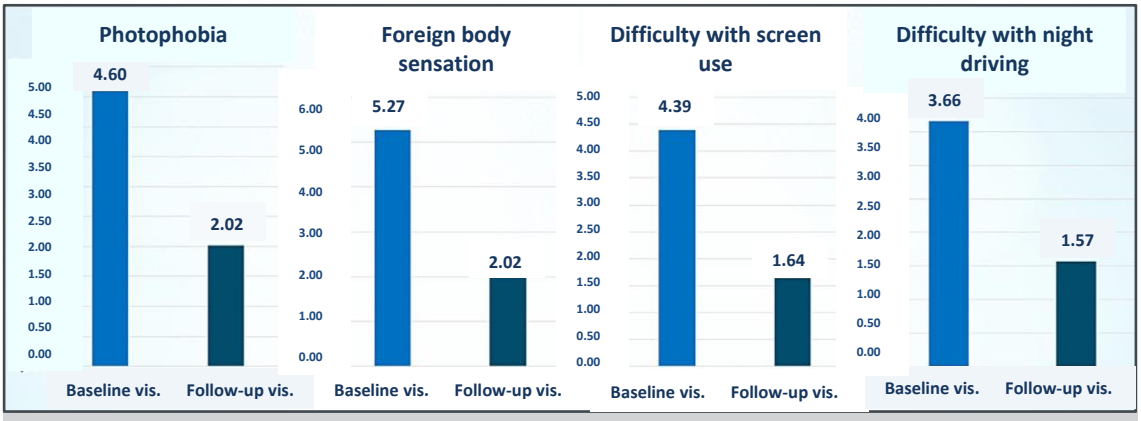

Figure 1 - Assessment of patient-reported symptoms before and after treatment with Lacrinova. A reduction in mean scores was observed for photophobia (from 4.60 to 2.02), foreign body sensation (from 5.27 to 2.02), difficulty with screen use (from 4.39 to 1.64), and difficulty with night driving (from 3.66 to 1.57).

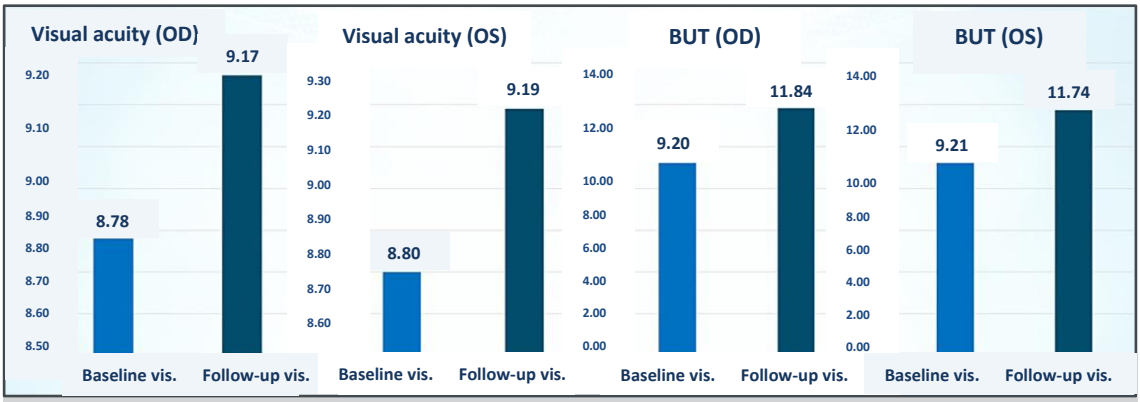

Figure 2 - Assessment of objective clinical parameters measured before and after treatment with Lacrinova. An improvement in visual acuity was observed in both the right eye (OD: from 8.80 to 9.19 decimal units) and the left eye (OS: from 8.80 to 9.19 decimal units). Similarly, tear break-up time (BUT) increased, from 9.20 to 11.84 seconds in the right eye and from 9.21 to 11.74 seconds in the left eye.

suitable for patients with moderate-to-severe dry eye disease or with symptoms refractory to standard treatments [5]. In this context, the present analysis aims to describe the real-world clinical experience with Lacrinova through an investigation conducted in a large cohort of treated patients, in order to evaluate its clinical efficacy, tolerability, and treatment adherence.

Materials and Methods

This study was based on prospective data collection from patients with DED who were enrolled and treated between August 2024 and April 2025 at several Italian specialist outpatient clinics. Patients with DED underwent both symptom-based and objective assessments, were treated with Lacrinova, and were re-evaluated after at least 90 days of therapy.

Adult patients were included if they had a clinical diagnosis of dry eye disease based on an OSDI score >12 and the presence of signs of DED, such as tear break-up time (BUT) <7 seconds and/or positive corneal fluorescein staining.

After initial screening, participants meeting the study criteria were assessed for the collection of the following data: age, sex, and DED-related symptoms and signs. DED-related symptoms (photophobia, foreign body sensation, difficulty with screen use, and difficulty with night driving) and patient-reported treatment appraisal (tolerability, adherence, and perceived efficacy) were evaluated using questionnaires with 0–10 rating scales. For all analyzed variables, distributions and percentage changes were calculated.

Results

Overall, 1,602 patients (658 men and 944 women) were enrolled, for a total of 3,204 eyes evaluated. Participants were assessed at baseline and after at least 90 days of treatment with Lacrinova. Differences in symptom severity before and after treatment are shown in Figure 1.

From a symptomatic perspective, reductions were recorded in photophobia (mean score change Δ 2.58, −56.08%), foreign body sensation (mean score change Δ 3.25, −61.66%), difficulty with screen use (mean score change Δ 2.75, −62.64%), and difficulty with night driving (mean score change Δ 2.09, −57.10%). In parallel, improvements in objective clinical signs were observed (Figure 2).

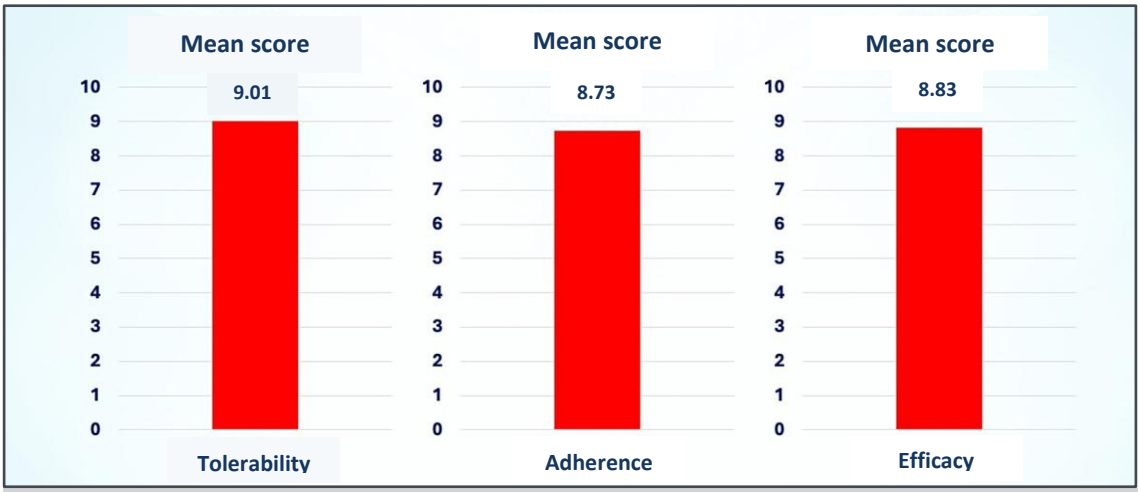

Figure 3 - Assessment of objective clinical parameters measured before and after treatment with Lacrinova. An improvement in visual acuity was observed in both the right eye (OD: from 8.80 to 9.19 decimal units) and the left eye (OS: from 8.80 to 9.19 decimal units). Similarly, tear break-up time (BUT) increased, from 9.20 to 11.84 seconds in the right eye and from 9.21 to 11.74 seconds in the left eye.

Specifically, improvements were observed in visual acuity (Δ OD 0.39 decimal units, +4.25%; Δ OS 0.39 decimal units, +4.24%) and tear break-up time (BUT) (Δ OD 2.64 seconds, +22.29%; Δ OS 2.53 seconds, +21.55%) in both eyes. In addition, the number of patients showing any degree of corneal fluorescein staining decreased from 677 to 372 (−45.05%) in the right eye and from 669 to 379 (−43.34%) in the left eye after treatment. Finally, patient satisfaction with treatment was reflected by high questionnaire scores (>8.5) for tolerability, adherence, and perceived efficacy (Figure 3). No clinically relevant adverse events were reported following instillation of the eye drops.

Discussion

The results of this large multicenter observational study confirm the efficacy and excellent tolerability of Lacrinova eye drops in the management of dry eye disease (DED). The analysis of more than 3,200 treated eyes showed clinically meaningful improvements in the main patient-reported symptoms and in measurable signs of ocular surface involvement.

The improvement in subjective symptoms such as photophobia, foreign body sensation, visual difficulties during screen use, and night driving reflects an effective hydrating, stabilizing, and protective action on the tear film. These findings are consistent with previous studies highlighting the key role of hyaluronic acid in promoting ocular surface homeostasis and in reducing dry eye disease-related symptoms [6-8].

At the clinical level, the increase in tear break-up time (BUT) of more than 21% observed in both eyes indicates improved tear film stability after treatment, while the improvement in visual acuity and the marked reduction in corneal fluorescein staining suggest a reparative and protective effect on the damaged corneal epithelium. These effects are likely attributable to the specific composition of Ribohyal, which combines the viscoelastic properties of hyaluronic acid with the antioxidant and photoprotective functions of riboflavin, already known for their positive impact on cellular regeneration and protection against oxidative stress [9,10].

The very high level of patient satisfaction emerging

from the tolerability, adherence, and perceived efficacy questionnaires (>8.5 out of 10 for all assessed parameters) is particularly relevant given that, in everyday clinical practice, adherence to treatment is often one of the main challenges in the management of DED [11]. The liquid-to-gel formulation and the absence of clinically relevant side effects may have contributed substantially to this outcome, making Lacrinova a well-accepted and well-tolerated therapeutic option for patients. Although this was an observational study and therefore lacked a control group, the large sample size and the consistency of data collected across the participating centers strengthen the robustness of the findings. Nevertheless, future randomized controlled clinical trials are warranted to further validate the product's efficacy and to compare it with other tear substitutes currently available on the market.

In conclusion, the data from this study show that Lacrinova represents a valuable therapeutic option for the treatment of dry eye disease (DED), owing to its ability to significantly improve both subjective symptoms and objective clinical parameters, with high levels of patient satisfaction and tolerability.

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