ADVANCES IN DRY EYE MANAGEMENT

A journey from limitations to innovations.

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Over the past 20 years, our profession has seen remarkable progress in our understanding, diagnosis, and treatment of dry eye disease (DED). Ongoing research and scientific advances have persisted in driving innovation and addressing the unmet needs of the patients we serve. As a result, our knowledge about ocular surface disease continues to improve, and our treatment options have grown considerably. Let's review.

THE TFOS LIFESTYLE REPORT

The Tear Film & Ocular Surface Society (TFOS) stands as a global leader in eye health education, making significant strides in advancing our understanding of the complex tear film, while aligning the focus for future research. The TFOS Dry Eye Workshop (DEWS) and DEWS II reports were pivotal in the understanding of DED, as they brought together experts from various disciplines who fostered collaboration to define and classify dry eye, identify risk factors, and establish standardized diagnostic criteria.[1,2] The comprehensive nature of these reports significantly influenced the direction of research, leading to a deeper understanding of the multifactorial nature of dry eye.

The recently published TFOS Lifestyle Report[3] looked at the influence of lifestyle factors, such as screen time, beauty routines, nutrition, and geographic location, on ocular surface disease. This extensive report is the result of a collaboration of 158 experts from 38 countries over 3 years, and follows an evidence-based approach, emphasizing transparency and consensus-building in addressing the intricate relationship between lifestyle and ocular surface disease.

EARLY TREATMENT CHALLENGES

Early in my career, managing patients with dry eye presented challenges due to the limited treatment options available. Punctal plugs, although effective for tear retention, were not sufficient to address the complex nature of the condition. Cyclosporine offered relief for inflammation, but didn't target other aspects of dry eye, such as evaporation.

Eventually, we saw the introduction of meibomian gland-targeted treatments, with the introduction of the LipiFlow Thermal Pulsation System (Johnson & Johnson Vision), gland expression, and intense pulsed light therapy, in addition to an

increase in foundational dry eye treatment options, such as omega-3 supplements, lid hygiene, warm compresses, and artificial tears. The approval of lifitegrast ophthalmic solution 5% (Xiidra, Novartis), cyclosporine ophthalmic solution 0.1% (Vevye, Novaliq), and cenegermin-bkbj ophthalmic solution 0.002% 20 mcg/mL (Oxervate, Dompé) have broadened our therapeutic options. Gaps in our treatment capabilities still existed, particularly in the management of *Demodex* blepharitis and evaporative DED. But that was then.

DEVELOPMENTS IN 2023

Last year, the landscape of dry eye management changed drastically with two particular approvals that addressed long-standing unmet needs.

Tear Evaporation

Based on results from two pivotal phase 3 trials, the FDA in May approved perfluorohexyloctane ophthalmic solution (Meibo, Bausch + Lomb),[4] which demonstrated significant improvements in DED signs and symptoms, meeting primary clinical endpoints. The most common adverse reactions were blurred vision (reported by 1-3% of patients) and eye redness. Perfluorohexyloctane adopts an innovative approach, addressing the evaporative factors associated with DED with a novel molecule that is both water-free and preservative-free. This targeted focus presents a promising solution for individuals struggling with symptoms linked to tear film instability.

Demodex Blepharitis

Another noteworthy approval in 2023 was that of lotilaner ophthalmic solution 0.25% (Xdemvy, Tarsus Pharmaceuticals), a well-characterized antiparasitic agent that targets *Demodex* mites by selectively inhibiting parasite-specific gamma-aminobutyric acid-gated chloride channels. Blepharitis often arises from an infestation of *Demodex* mites, a common ectoparasite found on humans.[5] *Demodex* blepharitis affects an estimated 25 million Americans,[6] manifests with eyelid inflammation, redness, and ocular irritation, and has a negative effect on quality of life. The approval of lotilaner equips eye care practitioners with a valuable tool for navigating the multifactorial factors, including blepharitis, that contribute to a patient's dry eye symptoms.

The recent advances of lotilaner in addressing *Demodex* blepharitis and the encouraging outcomes observed in the Ersa phase 2a clinical trial[7] for the treatment of meibomian gland disease mark a pivotal moment in the field of eye care. Further analysis of the Ersa trial data is needed and could lead to the potential expansion of lotilaner's label to target meibomian gland dysfunction.

EVOLVING TREATMENT OPTIONS

The approvals of perfluorohexyloctane and lotilaner represent a broader shift towards diversified and targeted treatment options for dry eye disease.

Beyond traditional approaches to treating dry eye, innovation has emerged in other areas that also target the condition. Take, for example, the advent of precision medicine. Recognizing individual variations in patient presentations has allowed more tailored and effective treatment plans. This personalized approach takes into account genetic factors, environmental influences, and lifestyle considerations, thereby offering a more nuanced strategy for managing dry eye. Precision medicine has revolutionized dry eye management.

Finally, technological advances have also played a pivotal role in both refining diagnoses and managing dry eye. Advanced devices and diagnostic tools leverage AI to analyze patient data, leading to more accurate assessments and treatment decisions. Wearable technologies designed to monitor ocular parameters provide real-time data to enhance ongoing management strategies.

THE FUTURE OF DRY EYE MANAGEMENT

The journey from the limited treatment options of the early 2000s to the diverse and targeted approaches of today reflects the pioneering nature of dry eye research and management. The collaborative efforts of TFOS, coupled with technological advances and novel therapies, have propelled us forward and better equipped us to serve our patients with ocular surface disease.

As we enjoy the benefits of the latest drug approvals and celebrate those to come, it will behoove us to remember that the future of dry eye management is characterized by precision, technological integration, and a deeper understanding of the multifaceted nature of the condition. An ongoing commitment to research and development will ensure that we continue to meet the evolving needs of our patients. ■

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