OSI

Ocular Surface Insight

Issue 23

Standing on the Shoulders of Giants: A Journey Through the History of Dry Eye Disease

Seeing Beyond the Surface: The Power of Skin Assessment in Dry Eye Management

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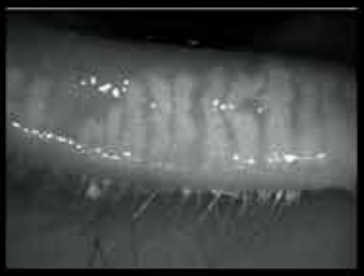

2 **INFLAMMATION**
Rosacea and blepharitis

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Ocular Surface Insight

"The important thing is to never stop questioning."

Albert Einstein

Charting a New Era in Ocular Surface Care: TFOS, Technology & the Road Ahead

Welcome to the 23rd issue of OSI Magazine!

Welcome to the 23rd issue of OSI Magazine — an edition that marks a pivotal moment for the future of ocular surface care.

We find ourselves at the start of a new chapter. With the release of **TFOS DEWS III**, our collective understanding of dry eye disease has evolved once again. This latest report represents more than an update — it reframes how we define, diagnose, and approach DED, urging clinicians to look beyond symptoms and embrace a more **driver-based**, **personalised** model of care. It challenges us to think holistically, to question habitual protocols, and to integrate new layers of insight into daily practice.

At the same time, the rapid rise of **artificial intelligence in ocular surface diagnostics** is reshaping what is possible in clinic. AI-powered imaging, keratoconus screening, and automated tear film and lid margin assessment are emerging as powerful tools to enhance accuracy, efficiency, and clinical decision-making. No longer a futuristic concept, AI is now stepping into the consulting room — not to replace clinicians, but to empower them with deeper, faster, and more consistent analysis. The intersection of human expertise and intelligent technology is where the next wave of ocular surface progress will be built.

This edition brings together thought-provoking features that reflect this evolution. From the transformative potential of AI in DED and corneal care, to the shift toward **personalised dry eye management** shaped by TFOS DEWS III, the articles ahead spotlight a profession moving forward with purpose, innovation, and unity.

As we embrace this new era, OSI remains committed to being a platform where science meets real-world practice — a space for sharing knowledge, elevating standards, and shaping the future of ocular surface health together.

Here's to progress, collaboration, and the exciting journey ahead.

Samer Hamada

Samer Hamada,
MD, MSc, DO (hons), FRCSEd, FRCOphth

osimag.co.uk

About us

Ocular Surface Insight

Editor in Chief
Samer Hamada

Published by
VisionDuo Ltd.

Sales & Advertising
Denise Castell
denise@visionduo.com

Business Development & Marketing
Åsa Baudin
asa@visionduo.com

Conference & Educational Events
events@visionduo.com

Accounts
accounts@visionduo.com

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We stand with Ukraine!

Contributors

Mr. Samer Hamada
Consultant Lead
Queen Victoria Hospital East Grinstead
Director & Lead Consultant
Eye Clinic London, UK

Ms. Priya Udani
BSc (hons) MBBS FRCOphth
Consultant Ophthalmologist - Oculoplastics / Dry Eye Expert
Founder and owner of Aesthetic Visual Result LTD, UK

Mr. Rolando Toyos
Medical Director, Founder
Cataract Surgery, LASIK, Glaucoma and Dry Eye
Toyos Clinic, USA

Ms. Sarah Farrant
Optometrist and
Dry Eye Specialist
Earlam and Christopher, Taunton, UK

Mr. Diya Baker
ST5
Royal Wolverhampton NHS Trust, UK

Ms. Sheena Tanna-Shah
Wellbeing Coach,
Optometrist &
Co-Founder of Evya
Northampton, UK

Mr. Tom Jenyon
Consultant Ophthalmologist
Royal Shrewsbury Hospital, UK

Editorial Panel:

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What's in the news?

Seborrheic Dermatitis Linked to Higher Rates of Epithelial Barrier Diseases

A large US retrospective cohort study has found that adults with **seborrheic dermatitis** are significantly more likely to develop a range of **epithelial barrier diseases** (**EBDs**) affecting the skin, gut, airways, and eyes—supporting the growing **Epithelial Barrier Theory** (**EBT**).

The study analysed data from over 20 million adults between 2016 and 2022, with more than 70 million person-years of follow-up. Of these, 3.62% had seborrheic dermatitis. Researchers found that affected individuals had notably higher odds of developing other EBDs, including:

- **Skin conditions**: atopic dermatitis, psoriasis, rosacea, alopecia areata, contact dermatitis, and chronic spontaneous urticaria
- **Gastrointestinal diseases**: coeliac disease and irritable bowel syndrome
- **Ocular surface involvement**: dry eye disease and ocular allergy
- **Respiratory disease**: rhinosinusitis

Interestingly, seborrheic dermatitis was associated with l**ower odds of COPD and pulmonary hypertension**.

These findings strengthen evidence that **epithelial barrier dysfunction may be a shared mechanism** driving multiple inflammatory conditions—and highlight the need for further research into targeted barrier-restoring therapies.

Authors: Meng S, Berna R, Hoffstad O, Takeshita J, Shin D, Chiesa Fuxench ZC, Margolis DJ.
Publication: Epithelial Barrier Diseases Among Adult Patients With Seborrheic Dermatitis. JAMA Dermatology.

High-Fat Diets Linked to Retinal Damage and Increased Ocular Disease Risk

A new systematic review highlights growing evidence that **high-fat diets** (**HFDs**) contribute to significant metabolic and inflammatory damage within the eye — particularly affecting the **retina and retinal pigment epithelium** (**RPE**).

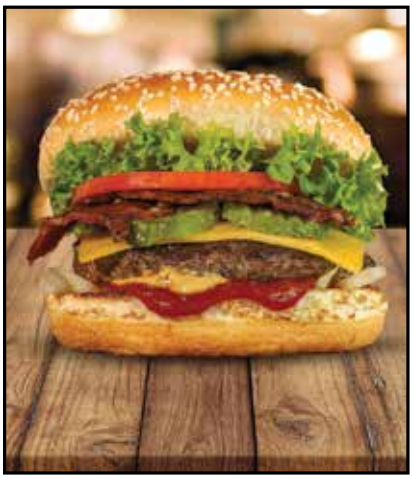
Researchers examined studies up to 2025 and found that excessive dietary fat leads to **cholesterol build-up and lipid metabolism disruption** in retinal and ocular tissues. This drives **oxidative stress and inflammation**, which can impair visual function and accelerate ocular disease processes.

Key findings include:

- High-fat diets trigger retinal and RPE structural and functional damage
- Lipid imbalance affects ocular blood vessels and increases oxidative stress
- **Omega-3 deficiency worsens inflammation**, whereas supplementation supports eye health

Notably, **omega-3 fatty acids** were shown to improve **tear film stability**, **corneal epithelial health**, **intraocular pressure regulation**, and provide **neuroprotective benefits**.

The review reinforces the importance of diet as a **modifiable risk factor** in ocular disease and supports omega-3 supplementation as a beneficial strategy for maintaining ocular surface and retinal health.



Reference:
Pieńczykowska K, Bryl A, Mrugacz M. *The Impact of a High-Fat Diet on Eye Health*. **Nutrients**. 17 October 2025;17(20):3271. doi:10.3390/nu17203271

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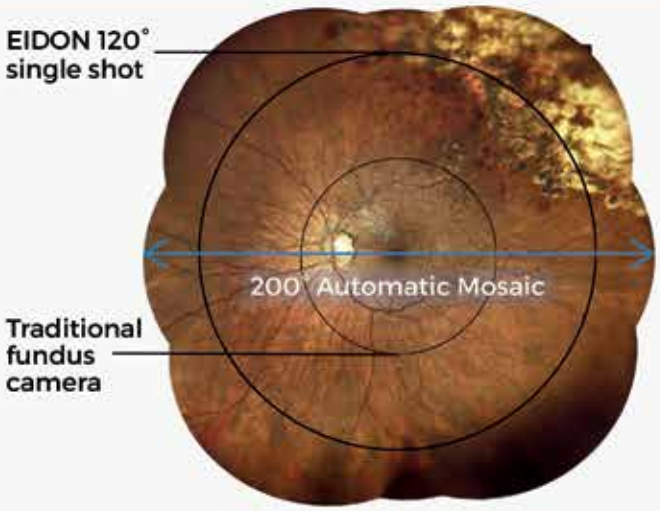

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Cyclosporine A: Evaluating Its Efficacy and Safety in Ocular Surface Disease Management

Edited by **Åsa Baudin**

Ocular surface diseases (OSDs), such as dry eye disease (DED) and various forms of keratitis, present significant challenges in ophthalmic practice due to their prevalence and potential to impair vision. A recent study published in the Journal of Medical Microbiology (March 2025, Volume 74, Issue 3) by Begimbayeva et al. offers valuable insights into the therapeutic role of 0.05% cyclosporine A (CsA) ophthalmic solution in treating these conditions. This article delves into the study's findings, contextualizes them within existing research, and explores the broader implications for clinical practice.

Overview of the Study

The study conducted by Begimbayeva and colleagues aimed to assess the impact of 0.05% CsA eye drops on patients with varying severities of DED. A cohort of 100 individuals received the treatment, with outcomes measured over a specified period. Key metrics included subjective symptom relief and objective clinical parameters such as tear film breakup time (TBUT), Schirmer test results, and Oxford scale scores.

Key Findings

Symptom Relief: Patients reported a significant reduction in discomfort and pain, with visual analogue scale scores decreasing from 6.8 at baseline to 3.7 by day 60.

Objective Improvements:

- **Tear Film Stability**: There was a notable enhancement in TBUT, indicating improved tear film integrity.
- **Tear Production**: Schirmer test results showed increased tear production, reflecting the therapeutic effect of CsA on lacrimal gland function.
- **Ocular Surface Health**: Improvements in Oxford scale scores suggested a reduction in corneal and conjunctival staining, indicative of healing on the ocular surface.

Safety Profile: Approximately 20% of participants experienced moderate side effects, including instillation site pain and ocular redness. Importantly, these adverse events did not necessitate discontinuation of therapy.

Comparative Analysis with Existing Literature

The findings of Begimbayeva et al. align with prior research underscoring the efficacy of CsA in managing OSDs. For instance, the IMPACT study, a prospective evaluation involving 40 patients, demonstrated significant reductions in ocular surface staining and improvements in visual performance over a six-month period of CsA treatment. Participants also reported enhanced tear production and stability, corroborating the results observed in the Kazakhstani cohort.

Similarly, a study assessing the efficacy of 0.05% CsA ophthalmic gel in DED patients revealed that 73.7% of subjects experienced at least a one-point improvement in inferior corneal staining scores after 84 days, compared to 53.2% in the vehicle group. This reinforces the therapeutic potential of CsA in enhancing ocular surface health.

Moreover, investigations into non-infectious keratitis associated with connective tissue diseases have highlighted the benefits of topical CsA. In cases where systemic immunosuppression was ineffective or contraindicated, topical CsA facilitated re-epithelialization and halted corneal melting, emphasizing its role in managing severe ocular surface inflammation.

Mechanisms of Action

CsA is a potent immunomodulatory agent that inhibits T-cell activation by binding to cyclophilin, thereby preventing the transcription of pro-inflammatory cytokines. In the context of OSDs, this mechanism reduces ocular surface inflammation, leading to improved tear film stability and enhanced tear production. The anti-inflammatory properties of CsA are pivotal in breaking the cycle of inflammation that perpetuates DED and related disorders.

Clinical Implications

The consistent evidence supporting CsA's efficacy has significant implications for clinical practice:

- **Treatment of Moderate to Severe DED**: CsA offers a viable option for patients unresponsive to conventional therapies, providing both symptom relief and objective improvements in ocular health.
- **Management of Inflammatory Keratitis**: In cases of immune-mediated keratitis, particularly when systemic treatments are unsuitable, topical CsA serves as an

effective alternative to control inflammation and promote healing.

- **Long-Term Safety**: While some patients may experience mild to moderate side effects, the overall safety profile of CsA is favorable, with adverse events being manageable and rarely leading to discontinuation.

Patient Selection and Monitoring

Appropriate patient selection is crucial to optimize therapeutic outcomes with CsA:

- **Indications**: Patients with confirmed diagnoses of moderate to severe DED, especially those with an inflammatory component, are ideal candidates.
- **Contraindications**: Individuals with active ocular infections or hypersensitivity to CsA should avoid its use.
- **Monitoring**: Regular follow-ups are essential to assess efficacy and detect potential adverse effects. Monitoring should include evaluations of visual acuity, ocular surface staining, tear production tests, and patient-reported symptom scales.

Future Directions

While current studies affirm the benefits of CsA, ongoing research is necessary to further refine its use:

- **Formulation Improvements**: Developing formulations with enhanced bioavailability and reduced dosing frequencies could improve patient adherence and comfort.
- **Combination Therapies**: Exploring synergistic effects of CsA with other therapeutic agents may offer more comprehensive management strategies for OSDs.
- **Long-Term Outcomes**: Extended studies are needed to evaluate the sustained efficacy and safety of CsA, particularly concerning chronic use.

Conclusion

The study by Begimbayeva et al., alongside corroborative research, reinforces the role of 0.05% cyclosporine A ophthalmic solution as an effective treatment for ocular surface diseases. Its ability to alleviate symptoms, enhance tear film parameters, and maintain a manageable safety profile positions CsA as a valuable tool in the therapeutic arsenal against OSDs.

Dry Eye Disease, Ocular Surface Health and being a Woman

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See better. Live better.

May 28th marked the International Day of Action for Women's Health.
At Bausch and Lomb we celebrated our commitment to eyecare and women's health with a fascinating panel discussion about how lifestyle factors, chronic medications, beauty and cosmetic procedures can impact eye and ocular surface health. Check out the link above for more information about the event and continue reading to find out why you should care about ocular surface health.

Dry eye disease (DED) is one of many medical conditions that affect women disproportionately to men. [1,2] It is a multifactorial disease of the ocular surface characterised by a loss of homeostasis of the tear film, which can cause sufferers considerable pain and discomfort. [2] This may seriously impact their quality of life – a recent study found that 19% of dry eye patients found the condition to be 'disabling'. [3]
DED is a very common condition, reportedly affecting 20 and up to 50% of the adult population globally, with higher prevalence in older adults. [4]

Consequently, the socioeconomic burden is considerable. [3] The high costs associated with DED include both direct costs to patients and healthcare providers, and even greater indirect costs due to missed work and reduced productivity. [2] In England in 2014, DED prescription medicines alone cost the NHS £27 million. [5]
Why is the tear film so important? The tear film lubricates, nourishes, and protects the ocular surface [6], and is essentially composed of two distinct layers, built from the secretions of glandular systems [7]:

- Aqueous layer - aqueous tear fluid produced from the lacrimal gland, and mucins produced by corneal goblet cells.
- Lipid layer - oils from the meibomian glands sited along both lid margins. The lipid layer lies on the surface of the aqueous layer where it reduces the rate of evaporation and provides lubrication during blinks.

Dry eye disease results from alterations in either layer, and is primarily classed in three broad categories [7]:

- Aqueous deficient dry eye (ADDE) in which the lacrimal gland fails to produce sufficient tear fluid.
- Evaporative dry eye (EDE) in which the meibomian glands fail to produce enough oil to cover the aqueous layer and slow evaporation.
- Mixed dry eye (MDE), with elements of both aqueous deficient and evaporative dry eye, is the category in which most patients will fall. Specifically, literature indicates that 85% of patients have some degree of Meibomian Gland Disfunction. [7,8]

In all cases, the loss of tear film stability or homeostasis is central to the pathogenesis of DED, because reduced tear fluid volume and/or increased evaporation will result in hyperosmolarity, which triggers osmotic stress in the epithelial cells and the glandular system in the ocular surface(2). This is combined with mechanical stress, as, without the normal cushioning of the intact tear film, blinking results in increased friction between the lids and the ocular surface(9). These conditions trigger an inflammatory response, which, if unresolved, will damage the epithelium and the glands, therefore further compromising the quality of the tear film, perpetuating a 'vicious circle' of increased osmolarity, inflammation and ocular surface damage. [9,10]

The symptoms of DED can be many and varied and range from mild to severe. Commonly reported symptoms are redness, a burning or stinging sensation, foreign body sensation, blurry vision, ocular pruritus and photophobia. [11,12]

Sharp or dull pain may also be felt, which is thought to be caused by nerve damage primarily and also inflammation. [2] Some of these symptoms may not be recognised as related to DED by some patients and healthcare professionals, which can make the diagnosis of DED challenging. [13] Additionally, symptoms do not always correlate with clinical signs on examination, so the level of discomfort experienced by a patient does not always correlate with the severity of the disease. [12] Severe or late-stage disease can result in corneal scarring or corneal complications. [12] Effective treatment is therefore vital to improve symptoms, prevent tissue damage, and improve patients' quality of life.

DED is more likely to affect women for a number of reasons. Hormonal changes that can occur throughout a woman's life underlie some of these such as pregnancy, menopause, and the use of oral contraceptives or hormone replacement therapy (HRT). [1] Variable levels of oestrogen and low levels of testosterone and other androgens can lower the production and quality of tear fluid and also lead to meibomian gland dysfunction. [2] Other autoimmune conditions such as rheumatoid arthritis and Sjogren's syndrome are also more prevalent in women and can cause dry eye via detrimental effects on the lacrimal and meibomian glands. [1,11] The aetiology can be complex because

there are many other factors that can increase the odds of developing dry eye disease which encompass systemic conditions, sociodemographic factors, environmental conditions, and various medications and surgeries. [11] For example, diabetes and multiple sclerosis may be linked to DED, along with ocular allergies or eczema around the eyes, increasing age, prolonged digital screen usage, smoking, long-term contact lens wear, and the use of antihistamines, antidepressants, or ophthalmic surgery, to name but a few. [11] Taking a comprehensive clinical history of a patient is therefore essential in order to not overlook a possible dry eye diagnosis.

The aim of treatment for DED is to restore tear film and ocular surface homeostasis. [2] Different treatments can be used for different stages of the disease. For mild disease, lid hygiene regimens and warm compresses are recommended. [2] If these are inadequate, a patient may be given punctal plugs, topical antibiotics or corticosteroids, or a topical immunomodulatory drug such as cyclosporine. The next stage of treatment may include soft bandage contact lenses and then surgery if necessary. [2]

However, the first treatment that the patient will typically access will be artificial tears. There is a huge range of artificial tear products available, containing one or more ingredients that perform different functions.

- As a basic starting point, a wetting agent is needed to supplement the aqueous layer and restore lubrication, viscosity and electrolyte balance. This may be carboxymethylcellulose (CMC), hyaluronic acid amongst others. [14]

- More specialised ingredients can be added to protect the ocular surface from hyperosmolarity, such as levocarnitine or trehalose. [14] Hyaluronic acid also has additional properties: high molecular weight molecules in high concentration promote wound healing and reduce inflammation. [14]

- Importantly, lipid-containing tear supplements should also be used in patients with some degree of evaporative dry eye to supplement the tear film lipid layer, thereby stabilising the tear film and slowing evaporation. [14]

There are, no doubt, many women – and men – who suffer the symptoms of dry eye without realising that it is a recognised medical condition that can be managed. Addressing this challenge is the first step to helping these patients regain their eye comfort and quality of life.

Bausch & Lomb were delighted to host a highly successful virtual event on 28th May, where our panel of inspirational women explored a range of fascinating topics in eye health. From the impact of lifestyle, long-term medication and refractive errors, to cosmetic use and beauty procedures, the session delivered valuable insights that resonated strongly with healthcare professionals.

The webinar, "Through Her Eyes: A Women's Eye Health Discussion", took place on 28th May at 19:00 BST and was exceptionally well-received by attendees.

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Dry Eye Treatments – Autologous Serum Drops vs Platelet Rich Plasma Drops

By **Rolando Toyo**

The concept of utilizing autologous blood serum to heal eye disease is several decades old. Dr. Fox et al. published a paper in 1984 in on the Beneficial Effect of Artificial Tears made with autologous serum in patients with Keratoconjunctivitis Sicca. Dr. Tsubota et al published a paper on the Treatment of dry eye by autologous serum application in Sjogren's Syndrome and has been championing the treatment ever since. The process can be simple with the patient having their own blood drawn and then using centrifuge technology to extract the serum leaving behind the red blood cells. For many years it was believed that providing serum drops alone could help handle tough cases of dry eye disease because the belief is that the serum could provide anti-inflammatory mediators. After a few years several more labs began measuring the products in serum and found that not only did you find anti-inflammatory compounds but also nerve growth factor. Many eye doctors to combat eye pain began to utilize AS eye drops to their treatments believing that these patients in pain had abnormal cornea nerves because an inflamed tear could cause destruction of all the ocular structures. The cornea nerve damage was proven by cornea confocal microscopy, CCM.

A strange thing happened in the evolution of the use of serum in the different medical specialties. Orthopedic, Plastic, and Neurosurgeons began to utilize serum but instead of stopping with serum they began finding ways to concentrate the parts of the serum that contained the molecules that could help patients like the anti-inflammatory mediators and nerve growth factors. They found that the platelet rich plasma (PRP) in the serum had the highest concentration of the mediators they wanted. Since these specialties were using the PRP as a one-time injection or application they didn't have to worry about storage or repeated application. Eye doctors on the other hand had to find a safe way to make this as a drop. They abandoned the thought of making PRP drops and instead found that adding balance salt solution (BSS) to the serum made it easier to freeze and store to be used over time as a drop. During this time patients could be using mixtures that were 30% serum with 70% BSS. The utilization of BSS dilutes any of the mediators that you were hoping for repair. Also freezing the drop caused a decrease of the potency of the mediators.

As I heard more about PRP I decided that I was going to try to make a PRP eye drop. Right away we discovered that pure PRP could not be frozen or it would clot. Now the PRP could be left in the refrigerator but over time since it did not have a preservative you run the risk of bacteria growing in the solution. I began trying different solutions to add to the PRP to keep it from clotting and growing bacteria. Through trial-and-error we found the right combination that could be used with pure PRP and would be less than 1% of the solution (proprietary solution that I freely give to doctors and labs with the signing of non-disclosure agreement).

I presented my findings at the International Society of Ophthalmic Pharmacology and Therapeutics (ISOPT) demonstrating how PRP drops could be made. Over the years, more technologies have been developed to collect the PRP in a totally enclosed system. Also, measurements of the PRP have shown that the concentration of anti-inflammatory mediators and nerve growth factor is 20 times more than what you find in pure serum which contains platelet poor plasma. Over the years we have refined our techniques and upgraded on the technologies to increase our yield of factors that could help the DED patient. We have presented how our PRP eye drops can improve the ocular surface including restoring badly damaged cornea nerves. The use of cornea confocal microscopy clearly shows that corneal damaged nerves can improve and that inflammation can be reduced with PRP. Ocular pain has been reduced with the use of PRP drops.

Now eye doctors including our clinic is utilizing PRP as an injectable to the lacrimal and the meibomian glands. Several studies have shown that the signs and symptoms of DED can be improved with injection into the lacrimal gland. I am taking a little different approach. For years in our aesthetic clinic we have micro-needled PRP into the skin to stimulate the fibroblasts to make collagen and elastin to improve texture and appearance of the face. We have also used micro-needling of PRP to the scalp to spark hair growth. I am now micro-needling PRP to the skin around the meibomian and lacrimal glands bathing these structures with PRP to improve function. It may be safer that injecting directly into glands causing possible scar tissue because the depth of the injection is controlled to the area above and not into the glands. Also, the gauge of the needles are much smaller than what is used currently by doctors who are injecting the lacrimal gland. I create PRP eye drops and then use some of the PRP for micro-needling.

For doctors who want to utilize PRP I suggest to research the different technologies available and choose one that provides a high yield quickly and is easy to use. It is much cheaper to use test tubes and a regular centrifuge to try to create a division of red blood cells, buffy coat, PRP, and PPP serum but the yields of beneficial factors is low. Also, you have to utilize a sterilization hood to decrease the risk of contamination and that can be challenging. Studies have shown that this technique yields low numbers of anti-inflammatory mediators and NGF. If you utilize one of the high yielding PRP technologies you have to purchase the system and the disposable receptacle that is needed for each case. These systems are more reliable and you can see the buffy coat and PRP clearly. The system does not require transferring products or several spins and allows clean disposal of byproducts. I believe that we are starting to catch up to the other specialties who have already discovered the power of PRP. I have believe that PRP is an essential treatment that should be utilized in all dry eye clinics.

Standing on the Shoulders of Giants: A Journey Through the History of Dry Eye Disease

By **Sarah Farrant**
Optometrist and Dry Eye Specialist

As clinicians, we are often so immersed in treating patients and navigating the ever-evolving landscape of diagnostics and therapeutics that we rarely stop to ask: how did we get here?

Understanding the roots of our current practices can be deeply valuable. It reminds us not only of the remarkable progress that's been made, but also of the recurring themes that continue to shape our work. As Sir Isaac Newton famously said, "*If I have seen further, it is by standing on the shoulders of giants.*" This philosophy resonates powerfully within eye care, especially in the field of ocular surface disease.

This retrospective was the inspiration for my opening address at OSI 2025. Dry eye disease has been a defining part of my professional journey, and looking back at its historical development allows us to better appreciate the challenges and innovations that lie ahead.

Ancient Beginnings: Tears, Gods, and Glands

Our journey begins 3,500 years ago in the ancient civilisations of Egypt, Mesopotamia, and China—where medicine was an intuitive mix of observation, spirituality, and natural substances.

In ancient Egypt, the *Ebers Papyrus*, discovered by German Egyptologist Georg Ebers in the 1870s, contains what is arguably the first written reference to the tear film: "*The water within; tear fluid and mucous secretion.*" Treatments included incense, myrrh, and lead salts. Egyptian eye makeup, particularly kohl, was multifunctional—used to reduce glare from the sun, repel flies, and prevent infection. While compounds like antimony had antibacterial properties, the widespread use of toxic lead also illustrates the fine line between remedy and risk.

Even more impressively, ancient Egyptians practised primitive meibomian gland treatments, expressing hard white granules through incisions in the conjunctiva—an early nod to evaporative dry eye.

In Mesopotamia, home to the Babylonians and Assyrians, clay tablets from King Ashurbanipal's library (c. 650 BC) included surprisingly specific ocular prescriptions. One remedy for dry eye instructed: "*Rub an onion, drink it in beer, and apply oil to the eyes. Thou shalt disembowel a yellow frog, mix its gall in curd, and apply to eyes.*"
An eyebrow-raising recipe perhaps, but a step toward codifying ocular complaints.

In China, acupuncture has been used since at least 2500 BC. Modern interpretations suggest acupuncture may help dry eye by modulating vagus nerve activity and providing a cholinergic anti-inflammatory effect. Meanwhile, in the Indus Valley (modern-day India and Pakistan), warm and cold compresses, eyewashes, and castor oil were used to treat "diseases of the wind" (*Xerokollyria*), with remedies including sesame, cinnamon, cardamom, and honey boiled in water.

Classical Ideas: Four Humours and First Descriptions

In ancient Greece, Hippocrates' humoral theory dominated medical thinking. Health was defined as a balance between four bodily fluids—blood, phlegm, yellow bile, and black bile. When eye baths failed to relieve symptoms, bloodletting was used to restore balance, either with a lance or with leeches.

In the Roman Empire, ocular health was highly valued. Vindolanda tablets discovered near Hadrian's Wall list eye disease among only three categories of soldier complaints—alongside wounds and illness—suggesting its prevalence. Roman healers created solid medicinal cakes known as *collyrium*, stamped with the maker's family name and passed down through generations. These were the world's first portable eye medications, crushed into pastes for application.

Aulus Cornelius Celsus (25 BC – 50 AD), an encyclopaedist, offered one of the earliest clinical descriptions of dry eye, which the Greeks termed *xerophthalmia: "The eyes neither swell nor run, but are red, heavy and painful at night, and the lids are stuck together by troublesome rheum."*

Anatomical Advances: Glands, Tears, and Tear Film

Fast forward to 1666: German physician Johann Meibom described the meibomian glands in a letter about the vessels of the eyelid, not knowing just how critical they would become to modern dry eye management. In the 18th century, Johann Zinn published the first comprehensive atlas of eye anatomy, including what would later be called the zonules of Zinn.

In the 19th and early 20th centuries, ophthalmologists began documenting eye dryness as a standalone complaint, though still poorly understood. Treatments were symptomatic—using saline, plant oils, and occasionally castor oil.

It wasn't until the 1930s and 1940s that major scientific advances began to converge. Henrik Sjögren described his eponymous autoimmune syndrome, and Jules Wolff proposed a trilaminar structure to the tear film—aqueous, mucin, and lipid.

By the 1970s, a conceptual shift occurred. The ocular surface was recognised as a functional unit involving the cornea, conjunctiva, lacrimal and meibomian glands, and their neural inputs. This laid the foundation for a more holistic understanding of dry eye.

Defining Dry Eye: From Disorder to Disease

Despite these gains, the modern dry eye landscape didn't take shape until the late 20th century. A major turning point came with the 1995 NEI/Industry Workshop, which introduced the concept of the lacrimal functional unit.

But it was the first *TFOS DEWS* report in 2007 that redefined dry eye as a disease, not just a disorder. This semantic shift was critical. A "disorder" implies dysfunction without an identifiable cause; a "disease" reflects a defined pathology requiring targeted management.

Key developments in the years that followed included:

- Baudouin et al. (2007): Introduced the "vicious cycle" model of dry eye pathogenesis.
- TFOS MGD (2011): Highlighted meibomian gland dysfunction as a dominant mechanism in evaporative dry eye.
- Korb & Blackie (2011): Proposed therapeutic gland expression, not just diagnostic probing.
- TFOS DEWS II (2017): Recognised neuropathic pain and confirmed MGD involvement in over 80% of cases.
- TFOS DEWS III (2025) Report
- TFOS Lifestyle Report (2023): Reviewed environmental and behavioural triggers such as screen time, diet, and cosmetics.
- BCLA CLEAR Report (2021): Reinforced the link between the ocular surface, contact lenses, and inflammation.

Evolution of Therapies: Compresses, Cyclosporine, and Clinical Confidence

Treatments have evolved alongside our understanding. Ancient compresses made from warm goat's milk or rosewater have given way to microwaveable heat masks. Lid hygiene, once managed with egg whites and teabags, shifted in the mid-20th century to selenium shampoos and, by the 1980s, baby shampoo.

Though baby shampoo was widely used for its gentleness, studies later showed it disrupted goblet cells and mucin secretion. Despite these concerns, many clinicians continued recommending it due to a lack of alternatives—until modern foams and micellar solutions became widely available.

On the pharmaceutical front, **Restasis** (cyclosporine) was approved in 2003, followed by in-office device-based therapies like **LipiFlow** (2011) and **Blephex** (2013). **Eye drop preservatives** also came under scrutiny. Compounds like **thimerosal** and **BAK** were found to be pro-inflammatory and toxic. Today, preservative-free formulations, often delivered via unit-dose or ABAK-style bottles, are the gold standard for chronic use.

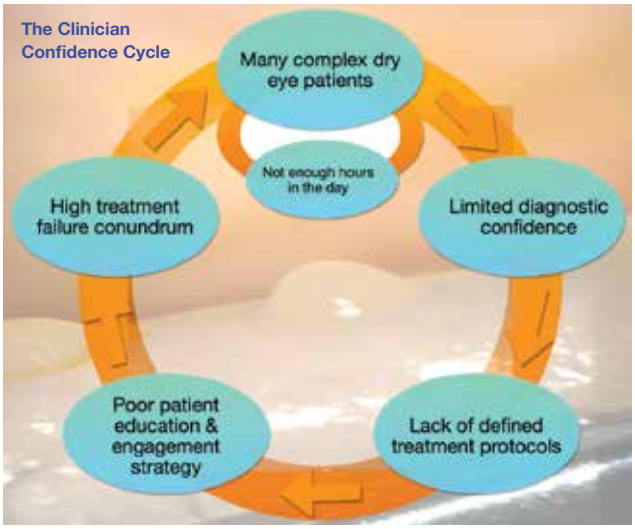
Research Boom and the Role of Clinical Collaboration
The early 2000s witnessed an explosion of dry eye research. A bibliometric review by Boudry, Baudouin, and Mouriaux (2018) highlighted an exponential increase in studies post-2000, driven by better diagnostics, imaging, and tear analysis techniques.

This era also brought a new spirit of collaboration. Institutions like **TFO**S, **BCLA**, and OSI help bridge research and clinical practice, promoting global best practices and championing education. These bodies have helped arm clinicians with evidence-based tools and treatment algorithms—vital in a field that has long suffered from underdiagnosis and undertreatment.

Modern Day Barriers: The Clinician Confidence Cycle

Despite our tools and knowledge, barriers remain. The Clinician Confidence Cycle describes the challenge: lack of time, diagnostic uncertainty, high device costs, and patient compliance issues can limit adoption of effective dry eye protocols.

Education remains our most powerful weapon. Understanding the pathophysiology and tailoring treatment—whether addressing inflammation, tear film instability, or lid margin disease—is central to success. Equally important is communicating clearly with patients and building trust through consistency and results.



Conclusion: Looking Forward, Learning from the Past

From ancient Egypt's lead salts and antimony, to TFOS lifestyle recommendations and IPL treatments, the story of dry eye is one of resilience, reinvention, and relentless inquiry.

As we stand on the shoulders of historical giants, we must also be the foundation for the next generation. Our understanding of dry eye disease has never been more robust—or more necessary. With continued collaboration, we can move from reactive symptom relief to proactive disease management.

Because, just like the treatments we use, no clinician works in isolation. We're all part of a connected history—one that continues to evolve.

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Dry Eye or Allergy – or Both? Getting Diagnosis & Management Right in 2025

Edited by **Åsa Baudin**

Emma, a 34-year-old contact lens wearer, arrived at her local practice complaining of burning, irritation, and intermittent blurred vision. She had been treated several times for "dry eye" with lubricants and lid hygiene advice — but her symptoms kept returning, especially during spring and after spending time outdoors. A closer look at her history revealed a key detail that had been missed: intense itching and a seasonal pattern. Her underlying problem wasn't just dry eye — it was allergic conjunctivitis. Once the allergy was treated, her symptoms improved significantly.

Emma's story is common. Dry eye disease (DED) and allergic conjunctivitis (AC) frequently coexist, share overlapping symptoms, and are often misdiagnosed. As clinicians balance busy clinics with growing numbers of ocular surface patients, being able to distinguish between DED, allergy, or a combination of both is increasingly important. Recent evidence — including new research published this year — reinforces the need for a structured approach to diagnosis, supported by appropriate testing and tailored management.

Why Misdiagnosis Happens

DED and AC share multiple symptoms: irritation, tearing, fluctuating vision, and sometimes redness. Patients often describe "gritty" or "sore" eyes, and many self-diagnose as dry eye due to awareness built through public campaigns. Meanwhile, itching — the hallmark symptom of allergy — is sometimes under-reported by patients unless specifically asked about.

Newer studies have shown that tear film instability is common in AC, and that ocular allergy can disrupt the lipid layer, meibomian gland function, and the ocular surface — mimicking evaporative dry eye. This contributes to the diagnostic challenge and highlights the importance of identifying when both conditions are present, as management differs significantly.

A Structured Approach to Diagnosis

TFOS DEWS III (2025 update) continues to emphasise a stepwise approach to diagnosis that includes symptoms, history, and identification of signs before determining subtype and cause. A clear and methodical framework reduces the risk of misdiagnosis and helps clinicians to decide when allergy, dry eye, or mixed disease is present.

A good starting point is asking the right questions. Itching, seasonality, rapid onset after allergen exposure, or relief with antihistamines strongly suggest an allergic component. Burning, dryness, discomfort using digital devices, and fluctuating vision are more characteristic of DED. However, a patient may report both — and this is the group that benefits most from careful assessment.

Slit-lamp examination provides further useful clues. Papillae on the tarsal conjunctiva, chemosis, eyelid dermatitis, and stringy mucus point to AC. Staining patterns, lid wiper epitheliopathy, and meibomian gland dysfunction (MGD) are associated with DED. If you see both, treat both.

Tear breakup time (TBUT) remains one of the most useful first-line tests. Reduced TBUT occurs in both DED and allergy, so a low value alone is not diagnostic — but it does reinforce the need for further examination. Non-invasive TBUT, meibography, and tear osmolarity (where available) can strengthen the diagnosis, particularly in cases of mixed disease.

The Role of Biomarkers in Diagnosis

Growing interest in inflammatory biomarkers has led to wider use of point-of-care testing such as MMP-9. Elevated levels of MMP-9 indicate ocular surface inflammation, but not the cause. A positive result can be seen in DED, AC, or both. Therefore, while biomarker testing can add confidence to your clinical impression, it should not be used in isolation. As a result, pairing these tests with case history, slit-lamp signs, and basic tear film evaluation remains essential.

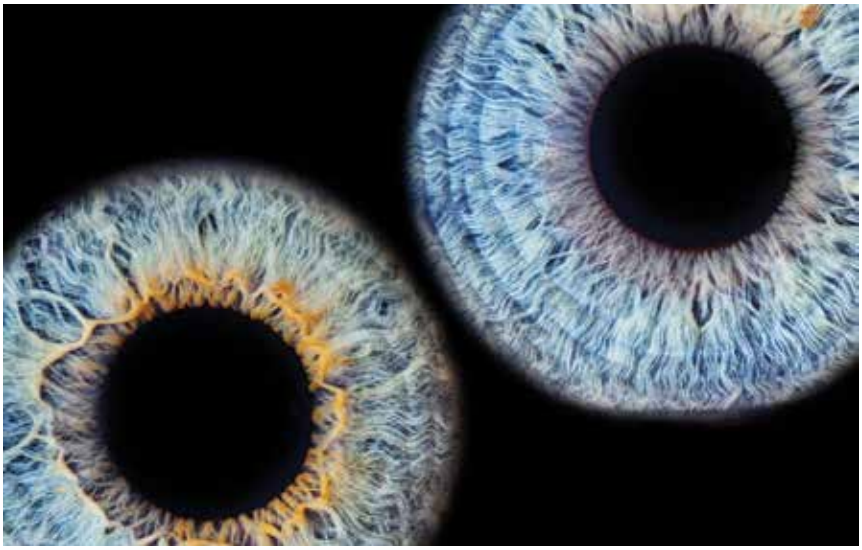
Emerging research in biomarkers and tear film analysis suggests a future where clinicians may be able to distinguish allergy-driven inflammation from dry eye-driven inflammation more accurately. For now, however, clinical judgement remains key.

When It's Both: Principles of Co-Management

The goal of management is to relieve symptoms, restore surface integrity,

and reduce inflammation — but the sequence of treatment matters.

For the allergic component, dual-action antihistamine/mast-cell stabiliser drops are usually the most effective first-line therapy. Cold compresses, avoidance



of triggers, and lubricants can provide additional relief. Short courses of topical corticosteroids may be appropriate for moderate to severe cases under ophthalmologist supervision.

For the dry eye component, supporting the tear film and restoring ocular surface health is critical. This may include lubricants (consider lipid-enhanced if evaporative), lid hygiene, warm compresses, and MGD treatment. When inflammation is significant, topical anti-inflammatory therapy may also be needed.

A simple rule of thumb for mixed cases: **treat allergy first to reduce the inflammatory load, then optimise the tear film**. Combining treatments thoughtfully avoids drop burden and ensures patients don't abandon therapy prematurely.

Lifestyle and Patient Education

Lifestyle modification can make a meaningful difference. Identifying environmental triggers — whether pollen, dust, pets, or cosmetics — can empower patients to take control of symptoms. Digital device use, contact lens wearing habits, and indoor air quality should also be reviewed. Educating patients that allergy and dry eye often coexist reinforces the need to follow the full treatment plan, even after symptomatic relief is achieved.

When to Refer

Referral should be considered when:

- symptoms are persistent or severe despite first-line treatment
- atopic keratoconjunctivitis or vernal disease is suspected
- there is suspected systemic allergy requiring testing
- specialist therapy (e.g., immunotherapy) may benefit the patient

Recognising when to escalate care is just as important as making the initial diagnosis.

From Algorithms to the Ocular Surface: AI Current Applications and Future Directions

By **Dr Ahlam-Nourelhouda Boussaid Othmani**, FY2, United Lincolnshire Hospitals NHS Trust & **Mr Diya Baker**, ST5 , Royal Wolverhampton NHS Trust.

Introduction

Artificial intelligence (AI) has become a transformative force in numerous fields, including medicine. In ophthalmology, AI holds particular promise due to the field's reliance on imaging, making it a natural fit for AI-driven tools that can improve diagnostic accuracy, personalise treatment, and reduce clinician workload [1]. The ability of AI systems to process extensive datasets and recognise complex patterns enables more efficient and precise care [2]. It has vast potential which are especially pronounced in specialties such as ocular surface disease, where image-based recognition plays a pivotal role [3].

AI encompasses a range of technologies, including machine learning (ML), deep learning (DL), natural language processing (NLP), and computer vision. AI refers to the simulation of human intelligence processes by machines [4]. ML, a subset of AI, uses algorithms trained on data to make predictions and decisions, and is widely used in ophthalmology for analysing medical images and disease prediction [5] [6]. DL, a more advanced form of ML, employs multi-layered neural networks to handle complex image recognition tasks, such as identifying diabetic retinopathy, glaucoma, age-related macular degeneration (AMD), and retinopathy of prematurity (ROP) [7] [1]. DL models are valued for their independence, speed, objectivity, and non-invasive nature. NLP, another branch of AI, facilitates machine understanding of human language, enabling the extraction of relevant data from electronic medical records [8].

AI Applications on the Ocular Surface

AI supports diagnostic and therapeutic processes across a variety of imaging modalities, including biomicroscopy, corneal tomography and topography, anterior segment optical coherence tomography (AS-OCT), specular microscopy, and in vivo confocal microscopy. On the ocular surface, AI tools assist in interpreting corneal topography, AS-OCT, and meibography; evaluating tear film; and detecting keratitis [9].

Slit lamp imaging applications include screening for keratitis, pterygium, corneal degeneration, and cataracts [10] [11].

In corneal topography and tomography, AI algorithms detect corneal ectasia and identify candidates for refractive surgery [12] [13]. In vivo confocal microscopy is enhanced with AI for diagnosing fungal keratitis and meibomian gland dysfunction [14] [15]. AI- driven corneal endothelial photography enables automated analysis of cell size, shape, and density, aiding in the detection of Fuchs endothelial dystrophy [16] [17].

Keratoconus

AI's utility is well illustrated in keratoconus (KC) diagnosis. KC is a progressive corneal disorder leading to myopia and irregular astigmatism, requiring early detection for optimal management [18].

Convolutional Neural Networks (CNN) models, a subtype of DL architecture particularly effective for image analysis, have shown strong performance in interpreting corneal imaging data. Trained on corneal topographies, CNN models can automatically learn and extract subtle spatial patterns indicative of KC, often beyond the threshold of human detection [19]. For example, Kuo et al. developed a DL model with over 90% sensitivity and specificity for KC detection [20]. CorneaNet, another model, used AS-OCT to evaluate corneal layers and achieved 99.5% accuracy in identifying KC [21]. KeratoDetect, trained on 3,000 corneal topographies, reached 99.3% accuracy [22].

Almeida et al. introduced the BESTi model, using 4,844 tomographic images to detect subclinical KC with an AUC of 0.99, sensitivity between 87.0% and 97.5%, and specificity between 93.9% and 98.5% [23]. Similarly, Al-Timemy et al. reported 98.8% accuracy for detecting KC and 81.5% accuracy when differentiating suspected cases from confirmed and normal cases [24].

A study from Noor Eye Hospital evaluated an AI model called Phoenix against experienced ophthalmologists. The model showed strong performance, with around 91% accuracy and good agreement with the experts, especially in identifying both manifest and subclinical cases [25].

A broader Cochrane review [26] also looked at many AI tools and found that, on average, these systems had very high

sensitivity and specificity when detecting keratoconus, particularly for more advanced cases. However, most of those studies used clinician-labeled data as the reference, rather than doing real-time comparisons in clinical practice.

That said, while AI models like CorneaNet and KeratoDetect report impressive results on imaging datasets, they have not yet been directly compared to clinicians in a head-to-head setting.

Therefore, while the early results are promising, especially for aiding in early detection, more clinical validation is still needed to say they truly match expert performance.

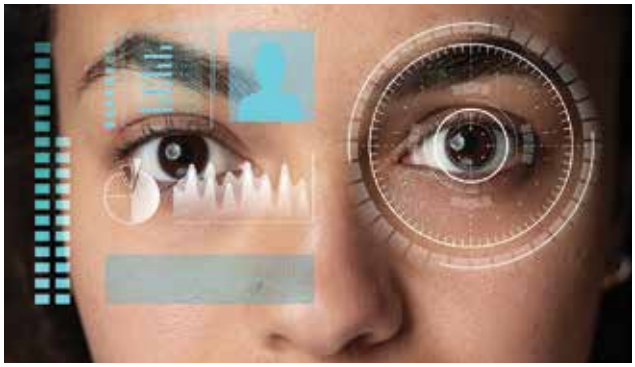
Dry Eye Disease

AI also aids in identifying dry eye disease (DED), including meibomian gland dysfunction (MGD), a chronic condition of the eyelid glands [27] [28]. Chase et al. developed a CNN-based model using 27,180 AS-OCT images that outperformed traditional diagnostic methods such as Schirmer's test and corneal staining [29]. Zhang et al. trained DL models on 4,985 in vivo confocal microscope images to classify MGD subtypes with 97-99% accuracy, >88% sensitivity, and >95% specificity [27]. This demonstrates the potential of AI-driven imaging to provide more accurate, non-invasive, and efficient diagnosis compared to traditional, subjective methods.

Keratitis and Corneal Disease

Keratitis, a leading cause of patient suffering and sight

impairment, is characterised by corneal inflammation and may result from infectious or non-infectious causes [30]. Gu et al. used Inception-v3 CNNs on 5,325 slit lamp images



to identify various corneal diseases, achieving AUCs ranging from 0.930 to 0.951 [31]. In a prospective study with 510 images, the model matched or exceeded the diagnostic accuracy of ophthalmologists.

Lv J. also developed a DL model for fungal keratitis detection using in vivo confocal microscopy [16]. Wang et al. created DL models using over 6,000 slit-lamp and smartphone photos to classify infectious keratitis into subtypes, with InceptionV3 achieving the best performance (AUC 0.9588) [32]. Li et al. evaluated three CNN models on over 13,500 slit lamp and smartphone images, achieving 96-97.7% sensitivity and 96.7-98.2% specificity in detecting keratitis, even from smartphone images, demonstrating potential for telemedicine applications [33].

By enabling accurate diagnosis from smartphone photos, their approach can improve access to eye care in remote areas or regions with less resources, where slit lamp equipment and specialists may not be available. It also opens the door to patient self-screening and early triage, reducing unnecessary clinic visits and facilitating timely referrals. Additionally, this method supports scalable community screening programmes and remote monitoring, offering a practical, cost-effective solution for enhancing continuity of care through teleophthalmology.

Other Anterior Segment Applications

Xie et al. designed the PIRSS model using Pentacam and InceptionResNetV2, achieving 94.7% accuracy in screening for at-risk corneas among refractive surgery candidates [15]. Sierra et al. used a UNet-based model for analysing corneal endothelium in specular microscopy images with >83% accuracy [19].

Li et al. also developed an AI system for detecting eyelid tumours using photographic images, employing Faster R-CNN and DenseNet121 with an AUC of 0.899 and 76.2% accuracy [34].

Discussion

AI is revolutionising ocular surface disease management through enhanced imaging, decision support, and predictive analytics. DL models show high performance in detecting KC, DED, and keratitis, while ML contributes to disease progression prediction. Personalised care and AI- assisted contact lens fitting are emerging trends. Remote evaluations via smartphone AI tools expand access to care.

Despite advancements, clinical integration faces hurdles: ensuring dataset quality (validity, meaning the data accurately reflects real clinical conditions, which is essential for building reliable models), generalising across diverse populations, improving interpretability, maintaining tool longevity, and

clarifying liability. Many AI systems act as ‘black boxes,’ limiting clinician trust, this means their internal decision-making process is unclear and not easily understood, making it hard for clinicians to identify the rationale and how the AI reached a certain conclusion. Additionally, current systems lack subclinical detection capabilities and require continued validation.

Future directions include refining AI models, expanding datasets, incorporating real-time monitoring via wearable tech, and validating through RCTs. With responsible development, AI holds transformative potential in enhancing diagnostic precision, efficiency, and patient outcomes in OSD.

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What's in the news?

TFOS DEWS III: The Big Update for Dry Eye Management

The recently published **TFOS DEWS III** reports mark a major overhaul in how dry eye disease (DED) is defined, diagnosed, subclassified and managed. The initiative drew on 80 experts across 18 countries, using an evidence-based process to update the 2017 DEWS II guidance.

Key Highlights:

- A refined definition of dry eye: *"Dry eye is a **multifactorial, symptomatic disease** characterised 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 aetiological factors."*
- Diagnostic refinements: The simplified screening-questionnaire tool (OSDI-6) is recommended for initial screening (cut-off ≥ 4), followed by key signs such as non-invasive tear breakup time <10 s or osmolarity ≥308 mOsm/L, and/or ocular surface staining thresholds.
- Sub-classification of DED drivers: Emphasis on identifying underlying drivers across three domains — tear film, eyelids/lids, ocular surface/anatomy/neurology — rather than relying solely on traditional "aqueous-deficient vs evaporative" categories.
- Management & therapy update: The Management & Therapy report reviews over 1,000 research papers and introduces three treatment algorithms aligning chosen interventions with the individual patient's subtype(s) and driver(s) of dry eye.
- Digest of wider research: The "Digest" report covers seven key topic areas (Sex, Gender & Hormones; Epidemiology; Pathophysiology; Tear Film; Pain & Sensation; Iatrogenic Dry Eye; Clinical Trial Design) and highlights emerging risk-factors, lifestyle influences and novel therapeutic targets.

Clinical Significance:

This suite of reports underlines the shift toward **personalised dry eye care** — where the eye-care practitioner identifies the specific drivers of a patient's disease and selects treatments based on the current best evidence for that driver profile. The updated definition and diagnostic algorithm aim to streamline everyday clinical workflow and reduce diagnostic variability. The expanded therapeutic framework recognises the complexity of DED and moves beyond one-size-fits-all approaches.

Reference:TFOS DEWS III Diagnostic Methodology Report; TFOS DEWS III Management & Therapy Report; TFOS DEWS III Digest Report (2025). American Journal of Ophtha

Top 5 Take-Homes from TFOS DEWS III for Eye-Care Professionals

1. New Definition Reflects Complexity
Dry eye is now clearly defined as a **multifactorial**, **symptomatic disease** driven by tear film and/or ocular surface homeostasis loss. Inflammation, hyperosmolarity and neurosensory dysfunction are recognised as core mechanisms — not just tear deficiency.

2. Quick, Standardised Screening Is Encouraged

Use OSDI-6 (**cut-off ≥4**) as a rapid screening tool, followed by key signs such as:

- NITBUT <10s
- Tear osmolarity ≥308 mOsm/L
- Positive ocular surface staining

This helps streamline and standardise diagnosis in clinic.

3. Diagnose by "Drivers", Not Just Type

Move beyond the classic "evaporative vs aqueous-deficient" labels. DEWS III encourages identifying **dominant disease drivers** across three domains:

- Tear film
- Eyelids / Meibomian glands
- Ocular surface / anatomy / neurosensory

This supports more personalised treatment pathways.

4. Treatment Must Be Personalised

The new algorithms emphasise **targeted therapy selection** based on the patient's subtype(s) and driver(s). Management should adapt over time, acknowledging that dry eye is often chronic, fluctuating, and multi-driver.

5. Holistic & Lifestyle Factors Included

DEWS III highlights lifestyle, systemic disease, medications, and iatrogenic causes as core **considerations in assessment and long-term management**. Patient education and behavioural modification are now considered essential components of care.

Seeing Beyond the Surface: The Power of Skin Assessment in Dry Eye Management

By **Priya Udini**

Introduction: Looking Beyond the Tear Film

Dry eye disease (DED) is rarely an isolated ocular event. It is a manifestation of systemic, dermatologic, hormonal, and environmental influences. Yet in clinical settings, evaluations often stop at fluorescein staining and tear breakup time. If we're only looking at the eyes, we're likely missing the root cause.

A proper dry eye consultation should always include skin assessment, lid architecture, hormonal status, lifestyle, and gut health. By stepping back and observing the whole patient, clinicians can direct treatment at the underlying pathology, not just the symptoms.

The Skin–Eye Interface: A Two-Way Street

The eyelid is skin—it breathes, absorbs, and reacts like the rest of the face. If the skin is inflamed, infected, or dysfunctional, it directly impacts lid margin stability, blink mechanics, and ocular surface health.

Clues in the Face: What to Look For

- Rosacea: Telangiectasia, erythema, and ocular inflammation. Strongly linked with meibomian gland dysfunction (MGD) [1].

- Seborrheic Dermatitis: Greasy scales around brows and lashes promote lid margin biofilm and chronic blepharitis.

- Atopic Skin: Thin, barrier-deficient skin causes hypersensitivity to drops and environmental allergens.

- Photoaging and Laxity: Alters lid-globe congruity and impacts blink efficiency-especially in postmenopausal patients [2].

A Practical Consultation: What to Ask and Assess

Hormonal History

- Are they perimenopausal, menopausal, or on HRT?

- Estrogen fluctuations and androgen deficiency alter meibum composition and goblet cell density [3].

Skin Routine

- Do they use retinoids or foaming cleansers?
- Many common skin products impair the skin barrier and inflame the lids.

Gut Microbiome

- Any IBS, autoimmune conditions, or chronic bloating?

- Gut dysbiosis is linked to systemic inflammation and ocular surface dysfunction [4].

Nutritional Intake

- Are they deficient in vitamin D, omega-3s, or zinc?
- These nutrients regulate epithelial healing, inflammation, and tear stability.

How to Perform a Quick but Effective Skin Check

Step	What to Do	Why It Matters
Observe	Look at full face under good lighting	Note redness, papules, scaling
Palpate	Gently assess lid tone and skin quality	Detect laxity or poor hydration
Ask	Review skin routine and facial product use	Identify hidden irritants
Examine	Look for collarettes, telangiectasia, lid margin thickening	Pinpoint inflammation and meibomian obstruction

Tools That Target the Skin–Eye Barrier

Zocular Foam Cleanser (ZEST)

Zocular products use Zokrex™ technology, based on okra polysaccharides with anti-inflammatory and anti-adhesive properties. The foam:

- Removes biofilm, demodex, and allergens
- Hydrates periocular skin
- Reduces staphylococcal overgrowth and inflammation

Use ZEST in-office as a deep clean or recommend Zocular foam daily at home for long-term support [5].

Peep Wand

This reusable, daily-use silicone wand has a pre-coated, non-irritating surfactant:

- Targets lash line debris without damaging skin
- Safe for delicate or aging skin
- Encourages patients with dexterity challenges to maintain hygiene

Recommend daily use for patients with chronic blepharitis, rosacea, or poor lid hygiene [6].

Regenerative Medicine in Ocular Surface and Skin Health

Polynucleotides:
Bio-repair Through Skin

Polynucleotides are purified DNA fragments derived from salmon or trout sperm. Originally used in dermatology, they now offer promising applications around the periocular area.

Mechanism and Benefits:

- Stimulate fibroblasts and collagen production
- Improve skin elasticity, hydration, and microcirculation
- Calm inflammatory responses in rosacea and atopic skin
- May support lid structure and improve tear retention

Polynucleotides can be applied via topical treatments or microinjections to periocular tissue, especially in patients with:

- Lid laxity
- Post-blepharoplasty dry eye
- Hormonal skin thinning
- Photoaging-induced lid dysfunction

This regenerative approach addresses the root biomechanical and structural issues affecting tear film dynamics [7].

Holistic Care = Lasting Results

Dry eye is not just about tears. It's about skin, hormones, microbiomes, lifestyle, and anatomy. When we stop and look at the full face—and ask the right questions—we uncover clues that fluorescein can't show.

Takeaway Pearls for Your Next Dry Eye Consult:

- Always assess the facial and periocular skin.
- Ask about hormones, gut health, and skincare.
- Use tools like ZEST and Peep Wand daily to manage inflammation.
- Consider regenerative options like polynucleotides when lid skin and structure are compromised.

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Wellbeing App EVYA for Health Care Practitioners

By **Sheena Tanna-Shah**

Optometrists Sheena Tanna-Shah and Piyus Tanna, founders of Optometry Wellness and Inspiring Success, in collaboration with Ask Fellow Optoms App founder Kishan Devraj Launched their wellbeing app EVYA for health care practitioners.

EVYA (where wellbeing meets the future) app aims to help individuals to track habits, assess the activities that support their personal wellbeing, and connect with others through various community groups.

We have been running wellbeing CPD for a couple of years, in which we offer a lot of personal development sessions where people are working on their own goals. Those sessions have been hugely beneficial for people to talk about their journeys and reflect on their goals, whether health and fitness, relationships at work, nutrition, or sleep. The next step was continuing this journey for individuals to keep working on their mental and physical wellbeing and to be able to do it in a supportive place together with others.

The new app features a log of daily habits which can be personalised to the individual user. You can make it really personalised to track daily habits and log it as a digital journal. It can then tell you how these habits have affected you by collecting data from smartphones and watches. The app will provide users with insights, and actions they can take to improve their wellbeing.

The app will also host communities where users can connect around a common subject or goal, such as fitness or nutrition, and even a share how their day has been in general. There is an option to share your name or keep it as anonymous, so if you have had a stressful day at work with a colleague you can share online with the aim to just release the stress, receive support from others and Sheena will also be their to provide coaching guidance.

Individuals can register their interest at **https://evya.app/**

Descemet Membrane Endothelial Keratoplasty: A Short Report of Surgical and Visual Outcomes at a District General Hospital in the United Kingdom

By **Dr Haris Shahzad**[1]
Dr Diya Baker[2]
Mr Tom Jenyon[2]

[1] University Hospitals Birmingham NHS Foundation Trust, Birmingham, UK
[2] Eye Department, Royal Shrewsbury Hospital, Shrewsbury, UK

INTRODUCTION

An intact cornea provides a refractive power for high quality vision; corneal diseases are thus a major cause of visual impairment and blindness worldwide.[1] In the United Kingdom, approximately 2500 corneal transplantations are undertaken each year, with a variety of indications and techniques.[2] Penetrating keratoplasty (PK) and Descemet membrane endothelial keratoplasty (DMEK) are two such techniques.

PK is a full-thickness corneal resection and transplantation, which enables treatment of disease in the epithelial, stromal, and endothelial layers. Full-thickness grafting also prevents stromal interface issues between donor and recipient tissues. However, shortfalls of PK include long post-operative recovery time and a higher chance of considerable refractive error due to graft astigmatism requiring contact lense.[3]

DMEK is a new alternative to PK as a corneal transplantation technique for corneal endothelial diseases such as Fuchs' endothelial dystrophy (FED) and bullous keratopathy (BK). DMEK is a partial-thickness posterior endothelial corneal graft which involves transplantation of the Descemet membrane and endothelium without stromal tissue, thereby avoiding degradation at the donor-recipient interface. The procedure is surgically challenging and involves difficulties in donor preparation, although the majority of comparative studies between DMEK and PK have found rapid visual rehabilitation following the procedure, lower rejection rate, fewer complications, and better visual outcomes.

Corneal endothelial transplantation guidance, published June 2009 by the National Institute for Health and Care Excellence (NICE), sets out a number of standards for outcomes in endothelial keratoplasty (EK)4. A randomised controlled trial of thirteen EK-treated eyes reported an improvement in mean uncorrected visual acuity (UCVA) of 0.21 LogMAR from 0.81 to 0.60 at 6-months follow-up. Regarding surgical outcomes, adverse events reported in the literature included graft dislocation, graft failure, and interface opacity. Studies reported total detachment requiring repeat operation rates of 2.0% to 8.5%. The interventional guidance committee noted that as techniques and experience for this procedure evolve, thorough data collection is required to allow ongoing review of outcomes. In this clinical audit, outcomes of patients who underwent DMEK at the Royal Shrewsbury Hospital (RSH) were compared to an external standard selected for its comparable size, cohort, and outcomes; a retrospective case series of patients who had DMEK at a Tertiary Eye Hospital (TEH) - Moorfield's Eye Hospital between 2013 and 2014.[5]

AIMS

The aim of this clinical audit was to assess the early surgical and visual outcomes of patients who underwent DMEK at the RSH between August 2020 and July 2021 compared to a retrospective case series of DMEK-treated patients at the TEH between July 2013 and August 2014.

MATERIALS AND METHODS

13 patients who underwent DMEK were included. DMEK alone, as well as triple procedure (keratoplasty combined with phacoemulsification/extracapsular-cataract-extraction followed by intraocular lens (IOL) implantation for coexistent cataract) were included. All surgeries were performed by two experienced surgeons (TJ and EC) with comparable techniques between August 2020 and July 2021 at the Ophthalmology Department of the Royal Shrewsbury Hospital, Shrewsbury and Telford Hospitals NHS Trust, United Kingdom.

Demographic information obtained from medical records included age, gender, and clinical indication. Main outcomes were intra-operative and post-operative complications, baseline best-corrected visual acuity (BCVA), post-operative BCVA, and three months post-operative BCVA. Values are given as mean ± standard deviation (LogMAR).

Surgical success was evaluated by comparing short-term complications including partial Descemet membrane detachment requiring air re-injection into the anterior chamber (rebubbling), total detachment requiring repeat operation, and primary graft failure. Functional success was measured by comparing visual outcomes in patients including pre-operative BCVA, post-operative BCVA, and three months post-operative BCVA. Surgical and visual outcomes were extracted from the THE's DMEK case series for comparison to this study, which included 14 DMEK-treated patients by a single surgeon between July 2013 and August 2014.

ETHICAL APPROVAL

No ethical approval was required for this original brief report.

RESULTS

Patient characteristics

A total of 13 patients who underwent DMEK surgeries between August 2020 and July 2021 with sufficient follow-up information were included in the audit for further analysis. Mean age was 70.2 ± 6.7 years (60 to 86). 9/13 (69.2%) were female and 4/13 (30.8%) were male subjects. The main indication for DMEK was 10/13 (76.9%) patients who had FED. In comparison, the 2013-2014 TEH's study included

14 DMEK-treated patients, with a mean age of 66 (49 to 80).
8/14 (57.1%) were female and 6/14 (42.9%) were male.
The clinical indication for all subjects was FED.

Table 1. Patient characteristics and aetiological distribution for DMEK-treated eyes at the RSH (2020 – 2021)

Total patients	13
Mean age ± SD (range)	70.2 ± 6.7 years (60 to 86)
Gender	9/13 (69.2%) F, 4/13 (30.8%) M
Fuchs' endothelial dystrophy (FED)	10/13 (76.9%)
Other	3/13 (23.1%)

Surgical outcomes

At the TEH's, partial Descemet membrane requiring rebubbling occurred in 5/14 (35.7%) of cases. There was 1/14 (7.1%) instance of total detachment requiring repeat operation, which occurred due to displacement of the bubble through a superior iris defect into the posterior segment within an hour of the DMEK procedure. Primary graft failure occurred in 1/14 (7.1%) case due to insertion of the graft into the anterior chamber complicated by raised IOP which occurred in 1/14 (7.1%) case in total. There were no cases of corneal oedema, corneal endothelial pigments, or anterior scarring after surgery.

In contrast, at the RSH, partial Descemet membrane detachment requiring rebubbling occurred in 1/13 (7.7%) eye which underwent inferior detachment. There were no instances of total detachment requiring repeat operation. Primary graft failure also did not occur. Other complications included 3/13 (23.1%) eyes with corneal oedema following surgery, 2/13 (15.4%) cases of corneal endothelial pigment on grafts, 1/13 (8.0%) instance of anterior scarring, and 1/13 (7.7%) case of raised intraocular pressure (IOP) requiring corneal paracentesis. Overall, there was a reduction in incidence of serious complications such as partial detachment (35.7% to 7.7%), total detachment (7.1% to 0.0%), and primary graft failure (7.1% to 0%) when comparing 2013/14 outcomes to 2020/2021.

Visual outcomes

At the TEH, seven patients were included in the visual analysis. Mean pre-operative BCVA was 0.30 (0.20 to 0.50). Mean BCVA at 3 months post-operatively was -0.03 (-0.20 to 0.20). Mean difference in BCVA between pre-operative assessment and at 3 months post-DMEK was an improvement of 0.33. In patients who underwent DMEK at the RSH (2020 – 2021), mean pre-operative BCVA was 0.79 ± 0.58 (0.00 to 1.78). Mean post-operative BCVA was 0.79 ± 0.62 (0.00 to 2.30), and mean BCVA at 3 months post-operatively was 0.39 ± 0.22 (0.00 to 0.78). Mean difference in BCVA between pre-operative assessment and at 3 months post-DMEK was an improvement of 0.40. Overall, although the TEH case series had a better pre-operative (0.30, 0.79) and post-operative (-0.03, 0.39) BCVA, there was a greater mean improvement in visual acuity in patients who underwent DMEK at the RSH (2020 – 2021) compared to TEH (2013 – 2014) (0.33 to 0.40).

See **Fig 2** on next page...

Fig 1:

Figure 1. Incidence (%) of DMEK complications at the RSH (2020 – 2021))

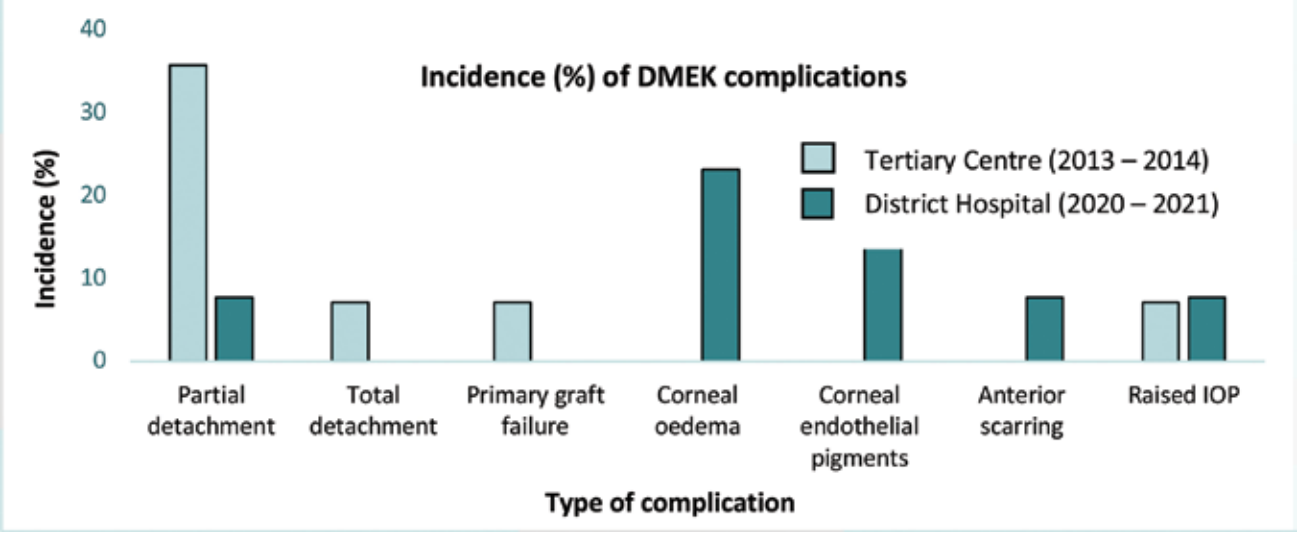
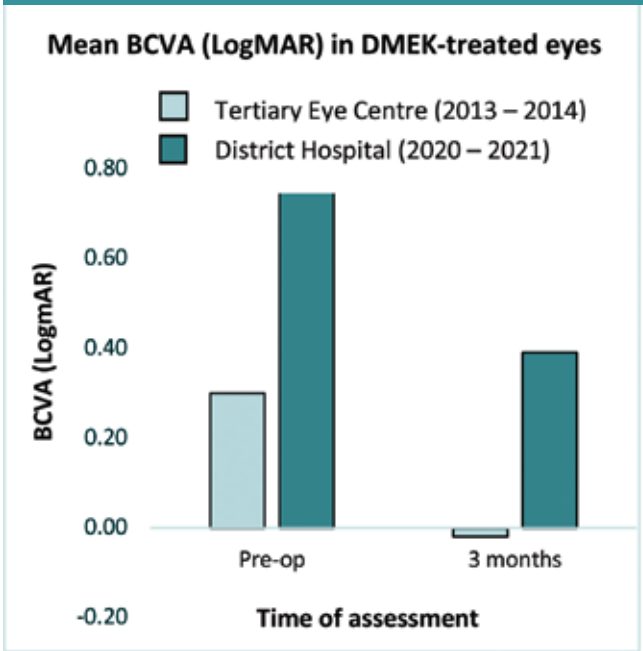
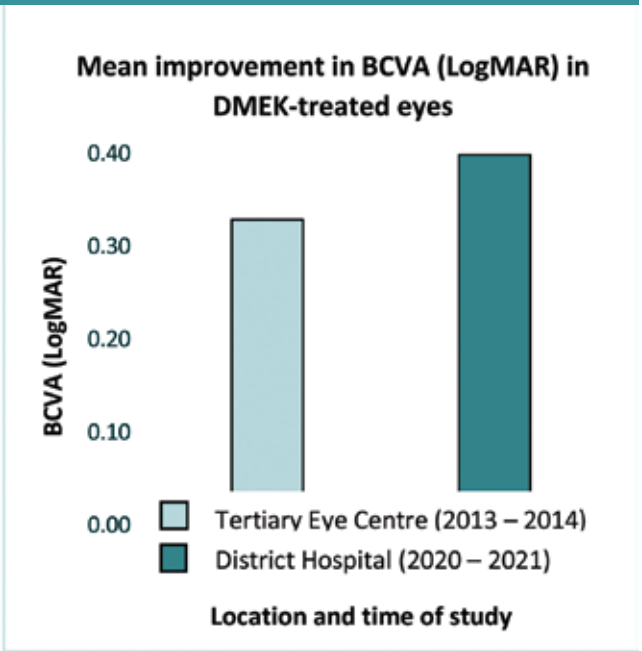


Figure 2. Mean BCVA (LogMAR) pre-op and 3 months post-op, and mean improvement in BCVA (LogMAR) at the RSH (2020 – 2021)





DISCUSSION

DMEK is a corneal transplantation technique involving a partial-thickness posterior endothelial corneal graft. As noted by the corneal endothelial transplantation guidance set out by NICE, as techniques and experience for this procedure evolve, thorough data collection is required to allow ongoing review of outcomes. Thus, the aim of this clinical audit was to assess the early surgical and visual outcomes of patients who underwent DMEK at the RSH between 2020 and 2021 compared to a retrospective case series of DMEK-treated patients at the TEH between 2013 and 2014. A retrospective review of 13 patients who underwent DMEK by two surgeons was carried out, and compared to the external standard.[5] Outcomes included demographic information, surgical outcomes, and visual outcomes at a 3 months follow-up.

The results of this audit have shown a reduced incidence of serious complications and a greater mean improvement in visual acuity when comparing the RSH (2020 – 2021) to TEH (2013 – 2014). Overall, there was a reduction in incidence of serious complications including partial detachment (35.7% to 7.7%), total detachment (7.1% to 0.0%), and primary graft failure (7.1% to 0%). Mean improvement in visual acuity in DMEK-treated eyes increased from 0.33 in 2013/14 to 0.40 in 2020/21.

The NICE interventional guidance[4] set out a standard of improvement in mean UCVA of 0.21 at 6-months follow-up, and a total detachment rate of 2.0% to 8.5%. Although not directly comparable due to differences in VA measurement and timescale, both the TEH and this RSH study exceeded this improvement in VA over a 3 months follow-up. Additionally, the 2020/21 review found a total detachment rate better than that set out by NICE (0.0% compared to 2.0% - 8.5%)

In 2013/14, one case of total detachment requiring repeat operation occurred due to displacement of the bubble through a superior iris defect into the posterior segment. Primary graft failure occurred in one case due to insertion of the graft into the anterior chamber complicated by raised IOP. There were no cases of corneal oedema, corneal endothelial pigments, or anterior scarring reported at the TEH. At the RSH, however, 3/13 (23.1%) eyes had corneal oedema following surgery, 2/13 (15.4%) cases of corneal endothelial pigment on grafts, 1/13 (8.0%) instance of anterior scarring, and 1/13 (7.7%) case of raised intraocular pressure (IOP) requiring corneal paracentesis. The TEH case series had a better pre-operative (0.30, 0.79) and post-operative (-0.03, 0.39) BCVA, although a greater mean improvement in visual acuity was seen in 2020/21.

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What's in the news?

3D Printing Could Protect Astronauts' Eyes on Long-Duration Space Missions

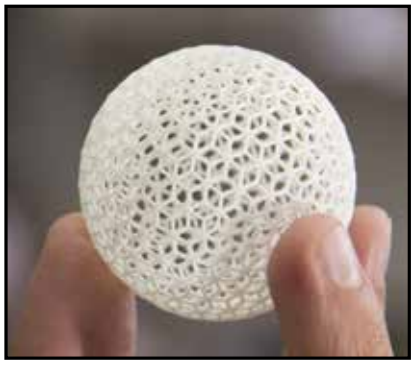
A new review explores how **3D printing and bioprinting technologies** could play a key role in safeguarding astronauts' vision during future long-duration space missions, including to Mars.

Extended exposure to **microgravity**, **cosmic radiation**, **and limited medical resources in space** heightens the risk of ocular conditions such as **Spaceflight-Associated Neuro-ocular Syndrome** (**SANS**) and **Spaceflight-Associated Dry Eye Syndrome** (**SADES**). Current ophthalmic care relies on specialist equipment that is impractical to transport into space — driving demand for **lightweight**, **adaptable**, **on-demand solutions**.

According to the review, 3D printing offers promising strategies including the **custom fabrication of**:

- Protective eyewear, contact lenses, and moisture chambers
- Radiation-shielding lenses and ocular surgical tools
- Potential future **bioprinted tissues** for ocular surface repair

Key challenges remain, particularly in producing durable, biocompatible materials and ensuring reliable 3D printing performance in microgravity. Further research aims to integrate advanced protective elements (e.g., boron nitride nanotubes) and optimise printing techniques for space conditions.



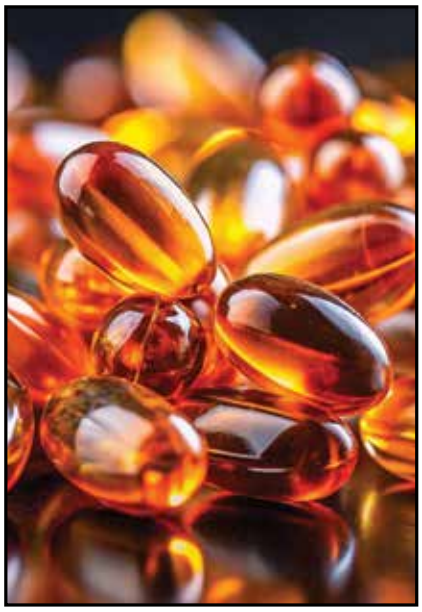
The authors note that innovation in **space ophthalmology** may also translate back to Earth, with new opportunities in personalised medical devices, **custom intraocular lenses**, and regenerative eye therapies.

Reference:
Pasha S, Ong J, Guo Y, Lee R, Waisberg E, Lee AG, Sarker P, Tavakkoli A. *Approaching ocular risks during spaceflight with 3D printing: Technical strategies to protect astronaut vision*. **Life Sciences in Space Research**. November 2025;47:98–104. doi:10.1016/j.lssr.2025.06.005

Vitamin D Gene Variant Linked to Dry Eye

A new study published in Life (Basel) (Oct 2025) reports a potential genetic link between vitamin D status and Dry Eye Syndrome (DES). The prospective study of 60 patients found that over **85% had insufficient or deficient vitamin D levels**, reinforcing growing evidence of the vitamin's role in ocular surface health.

Researchers explored four Vitamin D Receptor (VDR) gene polymorphisms and identified a **significant association with the ApaI (rs7975232) variant**, with the AA genotype more common in patients with low serum 25(OH)D3. While the other VDR polymorphisms (TaqI, FokI, BsmI) did not reach significance, the authors noted trends suggesting they may still influence vitamin D regulation in DES.



These findings support the idea that **genetic differences may partly explain why some dry eye patients fail to respond to standard treatments**. The authors suggest that VDR genotyping could, in the future, help guide personalised management—including tailored supplementation—in more resistant cases.

Reference: Savic B. et al. Life (Basel). 2025;15(10):1552. doi:10.3390/life15101552

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Instructions for Use. PAC-PPC-1178-v2
Date of preparation: Aug 2025

T. 1800 816 005 **E.** info@scopeeyecare.com **W.** www.scopeeyecare.com

ODM 5®

ophthalmic solution

24h

CONTINUOUS COMFORT*

Indications

ODM 5® Ophthalmic solution is recommended to reduce corneal oedema: oedema caused by corneal dystrophy, post-traumatic oedema or post-surgical oedema

Composition***

Sodium chloride 5%
Hyaluronic acid 0.15%

Properties

Osmotic effect regulating the **hydration** of the cornea[1]

- **Improvement in visual acuity**[2]
- **Decreased pachymetry**[3]

Protective effect[4] by stabilisation of the tear film

- **Improves eye comfort**

No preservatives with a potential cytotoxic effect for **chronic treatment**[5]

How to write a script:
ODM5 PF x 10ml
Or
5%NaCl+ HA 0.15% PF x 10ml

* Using the product over a full day.

A synergistic association of NaCl and Hyaluronic acid for corneal oedema treatment

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