IPL with C.STIM: the New Kid on the Block

Dry eye disease (DED) can have a profound impact on patients' quality of life. The DEWS II workshop recommends tailoring a treatment plan for each patient, based on its four levels of recommendations, the patient's systemic health, and personal and financial considerations. Intense pulsed light (IPL) is included in DEWS II level 2 treatment recommendations. In this article, optometrist Dr Jennifer Rayner takes a look at patient outcomes using the new C.STIM IPL, distributed in Australia by Quantel Medical|Ellex – Lumibird Medical.

LEARNING OBJECTIVES

On completion of this CPD activity, participants should be able to:

1. Understand the role of IPL as a therapy in a chronic condition such as dry eye,
2. Realise the unique characteristics of the C.STIM IPL device, and
3. Be familiar with the DEWS II levels of recommendation for managing dry eye.

WRITER Dr Jennifer Rayner

DRY EYE AND MEIBOMIAN GLAND DYSFUNCTION

DED is an increasingly common disease affecting millions of people globally. In essence, tear film instability leads to hyperosmolarity, and subsequent inflammation of the ocular surface, which can result in damage and neurosensory changes. The prevalence of DED, based on signs alone, can be as high as 75% in some populations.[1]

While many people are asymptomatic – or their signs outweigh their symptoms – many others report feelings of grittiness, burning, or stinging of the eyes; red eyes and/or lid margins; a feeling of dryness, heaviness, or tiredness or watering eyes. Patients often report a change or 'film' in their vision. The symptoms can be so dramatic that they can restrict work productivity, sociability and self-confidence.

Meibomian gland dysfunction (MGD) is thought to be the leading cause of evaporative dry eye (EDE).[2] It involves a change in the quality or quantity of the natural oil state (i.e., from oily to more viscous), or obstruction of the meibomian gland orifices.[3] Reduction of the meibum availability results in an increased tear evaporation rate, as the tears are not retained on the ocular surface between blinks.

There are many therapies to support a healthy tear film and ocular surface, including visual hygiene (good blink rates); topical artificial tears, gels and ointments; personal control of the local environment e.g., wind, pollution, air conditioning (with the use of dry eye glasses and humidifiers); lipid stimulation (manual expression, Lipiflow); biological tear substitutes, such as autologous serum eyedrop; lid hygiene and warm compresses; topical steroids; non-glucocorticoid immunomodulators such as cyclosporin and tacrolimus; oral tetracycline therapy to inhibit MMp9 production; omega-3 supplementation and LFA-a Antagonist Lifitegrast.[4]

Treating the resultant inflammation on the ocular surface is part of dry eye management, and IPL has proved to be a reliable, evidence-based approach to treating both MGD and the associated blepharitis, eyelid inflammation and telangiectasias.[5] In 2002, the Toyos Clinic noted anecdotal improvements in dry eye symptoms following IPL treatment of their patients with rosacea, and this has now resulted in eyelid specific IPL units targeted to treat dry eye.[6] A Xenon flashlamp emits light from 400-1,200 nanometre – and a filter placed over the lamp restricts the wavelength to the visible range of around 500nm. At this range, blood cells in telangiectasic vessels associated with inflammatory dry eye are absorbed by the light, causing coagulation and closure of the vessels, and halting the release of inflammatory mediators, as well as decreasing the bacterial overgrowth along the lid margins. As well, it appears that IPL can liquify meibum and dilate the glands, allowing for easier expression of inspissated meibum.[6]

ABOUT C.STIM

The recently launched C.STIM by Quantel Medical|Ellex - Lumibird Medical is the newest contributor to the IPL market here in Australia. C.STIM uses a unique Stim-ULI technology and flash-lamp water-cooling system to guarantee homogeneous energy throughout the entire treatment process. It has CE medical, class IIb and is also TGA approved. The IPL device operates in the 610-1,200 nanometre wavelength. This band of wavelength is less absorbed by melanin, which means it can easily be used in skin phototypes I through V, and limits the inflammatory response to the skin for an overall effective treatment outcome. C.STIM is designed to treat MGD by significantly reducing the vicious cycle of chronic inflammation through coagulation of inflammatory vessels and decreased bacterial and Demodex folliculorum loads. It can help speed up the meibomian and lacrimal gland metabolism by stimulating the parasympathetic nervous system and helps liquify the meibum from the heat generated by the lamp, for easier expression post-session. It is also thought that IPL stimulation of the parasympathetic nerve fibres may have an action on meibocytes and MG ductal cells; and that the sympathetic effect on the MG vasculature may indirectly affect MG function by the amount of hormone released.[7]

USING C.STIM

So how easy is it to use? The ergonomically designed handle fits easily into either hand, and the crystal head offers a surface area

large enough to use less shots (making the procedure quicker and easier for both practitioner and patient). It is small enough to be able to offer precise shots close to the lid margins as needed, and to avoid freckles, moles or tattoos that are not otherwise covered with white cover pencil. The unique design of the lamp allows for easy and thorough cleaning. After the patient is reclined in the chair, and their protective eyewear (provided with the unit) is in place, a thin layer of provided gel is applied to clean, make-up free skin. The ergonomics of the integrated water-cooling system, with the handle, enables flashes to be made in quick succession using the foot pedal, again facilitating a faster and comfortable process for the patient. Three flashes along the lower eyelid and one along the periauricular area are applied each side (eight shots per session). There is an intuitive interfaced HD screen, which guides you through setup and a safety setting means you cannot operate the device until you have applied your own protective eyewear (supplied with the unit), and the device is deactivated.

With a small footprint, the C.STIM is easily stored, and well-designed castors make moving the unit to the patient chair seamless. The energy is controlled by a pulse train, which limits the increase of tissue temperature, minimising any thermal damage or inflammation to the skin and discomfort for the patient. The unit offers 30,000 shots (3,750 sessions) and delivers the same energy level from the first to last shots (consumables and ongoing costs may vary). The default fluence is 8 J/cm^2 but this can be altered if required. Skin type V has a suggested fluence 6-8 J/cm^2 and test patching should be done two weeks prior, to check for any erythema or adverse reaction.

Following treatment, the gel is wiped off and all four eyelids should be expressed immediately, while the oil is liquified from the heat for the best outcome. The second session can be performed seven to 15 days after the first session; the third session 15–30 days after the first session, and a final fourth can be done 30 days after the initial session if needed. This protocol allows patients the flexibility to work around attendance without compromising on the outcome.

CASE STUDY

I was presented with a unique opportunity to compare the efficacy of two IPL units on the same patient. Ms Neen* was a 55-year-old woman who first saw me at our dry eye clinic in September 2020, complaining of a two-year history of intermittent scratchy, dry eyes that would often water (R>L), especially when wearing makeup. She had been diagnosed with dry eye by her optometrist nine months prior to seeing me and initially used an over-the-counter artificial tear twice daily. She tried oral antihistamines, as she suffered with mild hay fever, without success. She had been getting hot flushes for the last three years and was now peri-menopausal. Furthermore, 18 years prior, she had been diagnosed with Graves disease, which resolved without treatment. On initial examination, she had obvious reflex tearing in both eyes (R>L) consistent with her symptoms. Her left tear break-up time (TBUT) was still impaired at two seconds, despite the tearing. There was grade 2 conjunctival staining in both eyes, and no meibum was able to be expressed from any oil glands. Meibography showed healthy and functional meibomian glands.

> "After five months on cyclosporine use, Ms Neen felt there was only slight improvement and she consented to IPL treatment"

After an initial in-rooms lid warming and expression session, Ms Neen started using warm lid compress for 10 minutes a day at home and manuka honey 16% drops. Manuka honey has been shown to be a good antibacterial and anti-inflammatory agent that can aide ocular surface health.[4] Both treatments helped initially, but after more than five visits, she was still experiencing fluctuating symptoms. Her meibum was easily expressed, but only following heat compresses. We discussed the option of oral doxycycline, but she was concerned about her gut health so was not keen to do this (her mother had colon cancer and Ms Neen had regular colonoscopies as screening). She started preserved topical cyclosporine 0.1% compounded in oil twice daily, but found this caused prolonged visual blur so it was then compounded in an aqueous solution, which did not affect her sight. After five months on cyclosporine use, Ms Neen felt there was only slight improvement and she consented to IPL treatment. She underwent four sessions over an eight-week period in July 2021. She reported significant improvement (specifically, no watering) after the first session and her meibum was easier to express. She returned seven months later, complaining that her symptoms had returned and, although the IPL was successful, the results only lasted two to three months from the final session. We had been given the opportunity to trial the C.STIM IPL earlier that year and she was keen to repeat the IPL treatment with this unit. We had aimed to maintain consistency and mimic her previous protocol but, due to COVID-19 restrictions and her work needs, there were

gaps of four and three weeks between the four sessions respectively.

Each C.STIM session was performed using the default fluence of 8J/cm^2. We recorded an initial non-invasive keratography break-up time (NIKBUT) as an objective metric of R 3.44s, L 11.09s (Figures 1 and 2); and a DEQ5 score of 14 out of a possible 22 (> 12 can indicate Sjogrens Syndrome). Meibography was unchanged from the initial imaging the previous year (Figures 3 and 4). She reported a few initial days of irritation after the second session, then complete resolution of her symptoms following that. I saw her for review three weeks after the final session and interestingly, her NIKBUT was worse with R 3.25s, L 6.69s recorded. Her DEQ score had improved to nine (> 6 indicates dry eye).

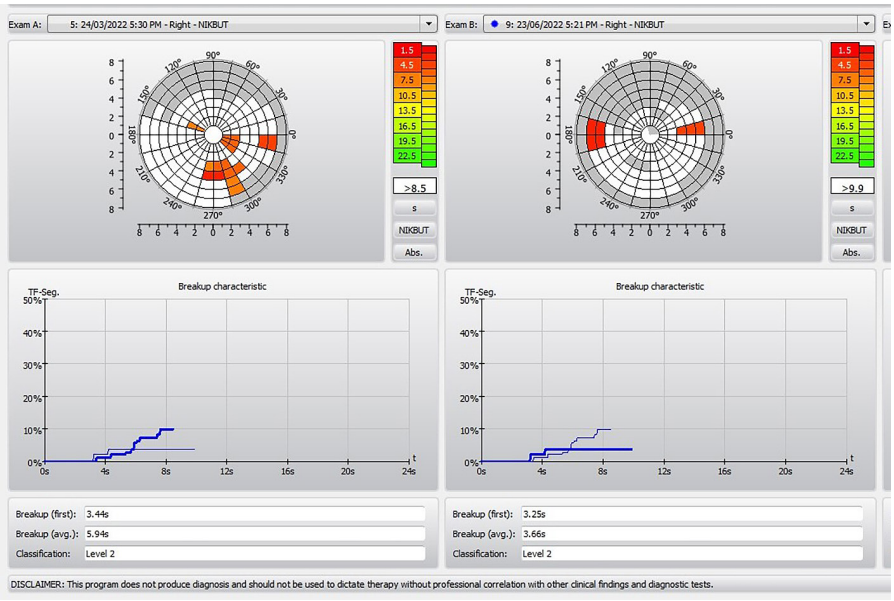

Figure 1. Right eye non-invasive kertograph tear break-up time.

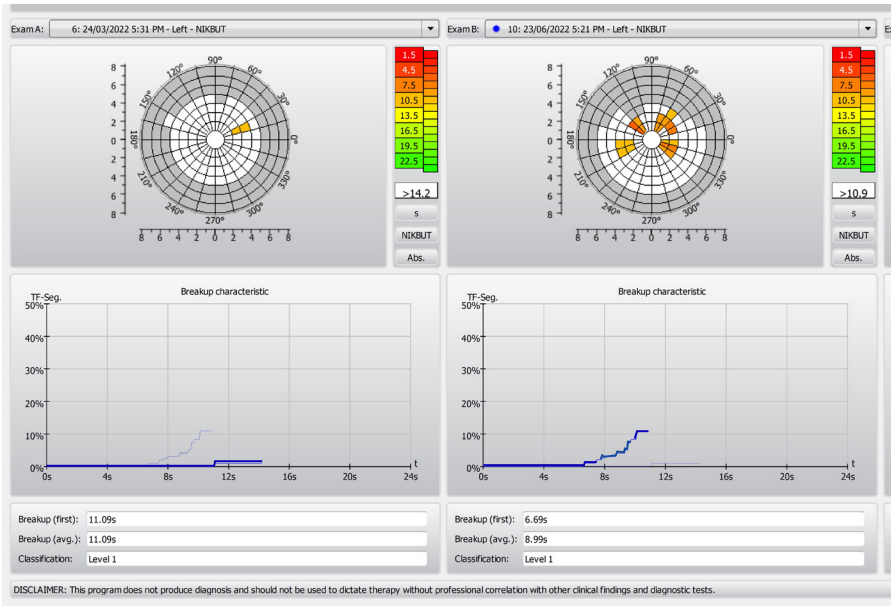

Figure 2. Left eye non-invasive kertograph tear break-up time.

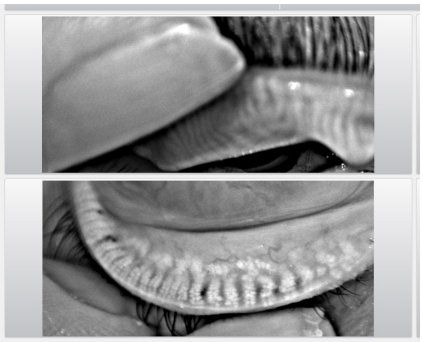

Figure 3. Right eye meibography.

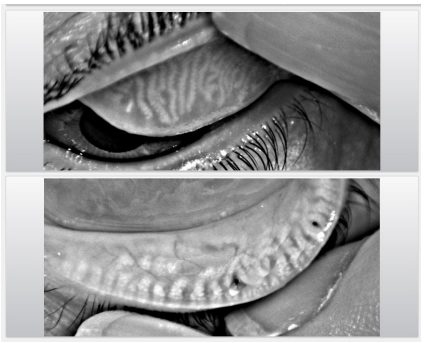

Figure 4. Left eye meibography.

There are some clear limitations to this case study – with the obvious question being, would she have had the same results if we just repeated our IPL? Additionally, normal maintenance protocol is often just one session every six to 12 months and we performed four – this may have given her a better result. Ms Neen's NIKBUT was worse on review, but tear film stability will vary throughout the day, depending on factors such as the time recorded, humidity, temperature, and activity. The focus of this case study was simply to present a patient who reported successful treatment of her symptoms with two different IPL units, making the outcome of the C.STIM very comparable to our practice-owned IPL. At the date of writing of this article, almost three months after her final session, Ms Neen remains symptom free.

DISCUSSION

Causes of dry eye are multifactorial and there are many known risk factors, including age, sex, race, inflammatory and auto-immune conditions, hormones, skin conditions such as rosacea, screen/computer use, contact lens wear, refractive surgery, environmental conditions and medication use.[1]

Ms Neen runs a small business with her husband, which requires prolonged levels of screen use most days. Prolonged screen use can lead to an increased risk of dry eye, likely from a decreased blink rate and incomplete blinking pattern.[8] In fact, changes to the ocular surface can be seen as early as after 20 minutes of exposure to digital screen use.[9] Regular screen breaks, the use of artificial tears if needed, and blink training should be part of the ongoing management of Ms Neen's dry eye.

Ms Neen has also experienced chronic stress from the demands of the business, particularly with the challenges that the COVID-19 pandemic brought over the last two and a half years. Increased psychological stress has been associated with an increase in dry eye symptoms.[10] Encouraging her to disengage from her business at the end of the workday, as well as consider yoga or meditation to help her relax, may be another way to help decrease her stress risk factor for her dry eye exacerbation.

Thyroid eye disease, or Graves ophthalmopathy, is an autoimmune disease where an excess of thyroid hormone is produced, which can result in an inflammatory response of the orbital tissue.[11] Ms Neen had not required any treatment for her Graves and her thyroid levels had been stable since her initial diagnosis. While it did not appear to be the cause of her more recent dry eye diagnosis, it should be noted as another risk factor. The more likely trigger for her dry eye was the change in hormones as she became peri-menopausal. Females are more likely to suffer with dry eye than males[8] and the sex hormones – oestrogens and

androgens – can affect all the components of the tear film included in the aqueous, lipid, and mucin. In meibum production, androgens contribute to the synthesis and secretion of meibum, whereas oestrogen can decrease meibum production. Studies are varied in finding hormone replacement therapy (HRT) can be beneficial, harmful or have no effect on dry eye.[12]

As demonstrated in this case study, IPL can be an extremely effective tool in the management of dry eye, but it is important to remember you are treating a chronic condition with risk factors that can contribute to the ongoing nature of dry eye, as demonstrated with Ms Neen. You may need to educate your patients regarding the continued use of lid hygiene, warm compresses and artificial tears if needed. This is because, even when our treatment modalities work well, typical chronic dry eye has 'bad days', making it helpful to use the available tools when needed to make the outcome of the IPL even better. IPL does not offer permanent relief of symptoms but can be used as an effective ongoing treatment, with maintenance sessions performed as the patient's symptoms return – typically anywhere from three to 12 months.[6]

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DEWS II BEST PRACTICE

The DEWS II report offers an algorithm that guides practitioners on best management for patients.

A case history will triage your patient's signs and symptoms, and help identify the cause and risk factors, as demonstrated in the case study presented.

Based on findings, decide on which diagnostic tests you need to perform to adequately diagnose the type and severity of dry eye, then create a treatment plan based on the DEWS II four levels of recommendations,[4] the patient's systemic health, and personal and financial considerations.

Level one includes patient education, lid hygiene, warm compresses, and omega-3 supplementation, modification of the local environment, systemic/topical medications, and artificial tears.

Level two includes treating demodex mite presence, tear retention through punctal plugs/dry eye glasses/goggles, meibum expression, IPL, oral tetracycline, topical steroids, topical cyclosporine and lifitegrast.

Level three steps up to the use of autologous serum eyedrops and bandage/scleral contact lenses.

Level four involves the use of amniotic membrane and other surgical approaches such as tarsorrhaphy.

Aside from oral tetracycline and the surgical interventions, optometrists with endorsement to prescribe therapeutics have access to everything on all four levels (depending on how comfortable you are to use them, of course).

Those without endorsement are far from disadvantaged – IPL is a perfect tool to have in the dry eye management portfolio.

Unfortunately, treating dry eye is not a one-treatment-fits all. But, having a variety of management options you can offer and tailor to your patients often brings more successful outcomes, happier patients, and a sense of clinical satisfaction for yourself.

SUMMARY

IPL is a safe, evidenced-based approach to treating dry eye. Those therapeutically endorsed and those without endorsement can perform the treatment in the clinical setting without the need for additional room, in a quick and easy manner. IPL treatment with C.STIM offers a unique technology that maintains consistent energy levels with each shot, and minimises any thermal damage to the skin, especially with darker skin types. mi

*Patient name changed for anonymity.

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Dr Jennifer Rayner BAppSc(Optom), GradCertOcTher started her working life as a registered nurse and worked extensively as an ophthalmic nurse and assistant in the public and private sectors before changing careers and graduating as an optometrist in 2003. In 2016, she co-founded South Australia's first stand-alone dry eye clinic – Alleve Eye Clinic. She is passionate about educating both colleagues and the public that dry eye disease can most certainly be treated and managed very effectively with their primary optometrist.

Dr Rayner has lectured on dry eye topics locally, nationally, and internationally in written, virtual and face-to-face forums. She sits on advisory boards for emerging pharmaceuticals as well as being a key opinion leader for dry eye equipment, and is proud to be a member of the current TFOS Lifestyle Workshops Public Awareness Committee.

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