

Outcomes of intense pulsed light therapy for treatment of evaporative dry eye disease

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ABSTRACT • RÉSUMÉ

Objective: To determine the clinical outcomes of intense pulsed light (IPL) therapy for the treatment of evaporative dry eye disease (DED).

Design: Multicentre cohort study.

Participants: Patients with a diagnosis of meibomian gland dysfunction (MGD) and dry eye presenting to the ophthalmology clinic at either the Duke Eye Center, Durham, NC, or Matossian Eye Associates' private practice in Pennington, NJ, and Doylestown, PA.

Methods: Clinical data were reviewed from 100 patients with diagnosis of MGD and DED who underwent IPL therapy from September 2012 through December 2014 at 1 of 2 centres (Duke Eye Center or Matossian Eye Associates). Demographics, clinical history, examination findings (eyelid and facial vascularity, eyelid margin edema, meibomian gland oil flow, and quality score—all graded on a scale of 0 to 4), tear break up time (TBUT), and ocular surface disease index (OSDI) scoring data were collected from each visit.

Results: On average, patients underwent 4 IPL sessions. There was significant decrease in scoring of lid margin edema (mean = -0.3; range -1.5 to 0), facial telangiectasia (mean = -0.7; range -2.5 to 0), lid margin vascularity (mean = -1.2; range -2.5 to 0), meibum viscosity (mean = -1.1; range -3 to 0), and OSDI score (mean = -9.6), all with $p < 0.001$. There was a significant increase in oil flow score (mean = 0.9, range -0.5 to 2) and TBUT (mean = 3.4 seconds, range -2 to 7), both $p < 0.001$. No significant changes in intraocular pressure or acuity were noted. There were no cases of adverse ocular effects.

Conclusions: IPL therapy for evaporative DED is a safe procedure. The positive change in objective clinical examination findings and subjective OSDI scoring data suggest that IPL is an effective treatment for patients with evaporative DED.

Objet : Déterminer les résultats cliniques d'un traitement de lumière intense pulsée (LIP) pour traiter la sécheresse oculaire.

Nature : Étude de cohorte multicentrique.

Participants : Patients avec un diagnostic de dysfonction des glandes de Meibomius (DGM) et de sécheresse oculaire vus à la clinique d'ophtalmologie du Duke Eye Center (Durham, Caroline du Nord) ou à la clinique privée Matossian Eye Associates de Pennington (New Jersey) ou de Doylestown (Pennsylvanie).

Méthodes : On a examiné les données cliniques de 100 patients avec un diagnostic de DGM et de sécheresse oculaire qui ont subi un traitement de lumière intense pulsée (LIP) de septembre 2012 à décembre 2014 à l'un de deux centres (Duke Eye Center ou Matossian Eye Associates). Les données démographiques, les antécédents cliniques, les résultats d'examen (vascularisation palpébrale et faciale, œdème du bord des paupières, libération de l'huile des glandes meibomiennes et score de qualité – tous notés sur une échelle de 0 à 4), le temps de rupture du film lacrymal (TRFL) et l'indice de maladie de la surface oculaire (IMSO) ont été recueillis pour chaque visite.

Résultats : En moyenne, les patients ont subi quatre séances LIP. On a noté une baisse significative des scores pour l'œdème du bord des paupières (moyenne = -0,3; fourchette : -1,5 à 0), la télangiectasie faciale (moyenne = -0,7; fourchette : -2,5 à 0), la vascularisation du bord de la paupière (moyenne = -1,2; fourchette : -2,5 à 0), la viscosité de la sécrétion meibomienne (moyenne = -1,1; fourchette : -3 à 0) et le score IMSO (moyenne = -9,6); $p < 0,001$ dans tous les cas. On a aussi noté une augmentation significative des scores pour la libération d'huile (moyenne = 0,9, fourchette : -0,5 à 2) et le TRFL (moyenne = 3,4 secondes, fourchette : -2 à 7); $p < 0,001$ dans les deux cas. On n'a noté aucun changement significatif de la pression intraoculaire ni de l'acuité visuelle. Il n'y a pas eu d'effets oculaires indésirables.

Conclusions : La thérapie LIP est une procédure sûre pour le traitement de la sécheresse oculaire. L'évolution positive des résultats d'examen clinique objectifs et des scores IMSO subjectifs indique que la thérapie LIP est un traitement efficace pour les patients souffrant de sécheresse oculaire.

Dry eye affects more than 20 million Americans and is one of the most frequent reasons for seeking eye care.¹⁻³ The prevalence of dry eye has been studied in a variety of populations and has been reported to be between 7% and 33%.²⁻⁷ Dry eye has a significant impact on quality of life.⁸ Schiffman et al.⁹ reported reduced quality of life in patients with dry eyes, who had a utility score similar to patients with moderate to severe angina. Additionally,

significant economic costs are associated with dry eye care. One model estimated that the annual direct cost of managing a patient with dry eyes was between \$678 and \$1,267 (range for mild to severe disease), which based on prevalence data would translate into a total annual U.S. cost of \$3.8 billion.^{10,11}

There are two major types of dry eye disease: (i) aqueous deficient dry eye, and (ii) evaporative dry eye.

Evaporative dry eye disease is caused by meibomian gland dysfunction (MGD). The International Workshop on Meibomian Gland Dysfunction defines MGD as “a chronic, diffuse abnormality of the meibomian glands, commonly characterized by terminal duct obstruction and/or qualitative/quantitative changes in the glandular secretion. This may result in alteration of the tear film, symptoms of eye irritation, clinically apparent inflammation, and ocular surface disease.”¹² The majority of patients seen clinically with dry eye disease suffer from MGD and evaporative dry eye.¹³

Until recently, the main stay of dry eye treatment has been frequent tear supplementation, hot compresses to liquefy plugged oil glands, omega-3 fatty acid supplements, and use of prescription medications such as cyclosporine drops, steroid drops, and/or tetracycline oral antibiotics. Many patients still remain symptomatic despite these treatments. Intense pulsed light (IPL) therapy is a relatively new treatment for evaporative dry eye. IPL has a long history in dermatology, often being used to treat patients with facial telangiectasias and erythema caused by rosacea.^{14,15} Using filters in the IPL hand piece, the broad-spectrum light emitted from the flash lamp can be selectively absorbed by oxyhemoglobin. The light energy is converted to heat and induces ablation of fine vascular structures. This process of selective photothermolysis is one of the proposed mechanisms of action of IPL for dry eye: The destruction of fine telangiectasias along the eyelid inhibits access of inflammatory mediators to the meibomian glands. Other potential mechanisms include a mild local warming effect to allow better expression of inspissated meibum and destruction of bacteria that cause inflammation at the level of the meibomian glands.

To date, IPL for dry eye treatment has not been well studied, as there are only limited studies in the literature

on its efficacy and safety.^{16,17} The purpose of this study was to evaluate initial outcomes of patients who underwent IPL for treatment of evaporative dry eye.

METHODS

The study was approved by the Institutional Review Board, adhered to the tenets of the Declaration of Helsinki, and was HIPAA compliant. A search was done to identify all patients who had undergone IPL for dry eye treatment from 2 centres: One academic institution (P.K. G.) and one private practice (C.M.)—from September 2012 to December 2014. IPL for dry eye treatment is an off-label use of a Food and Drug Administration–approved device. Informed consent was obtained from each patient before the procedure. In total, 111 patients were identified, and 11 patients were excluded from the study because they underwent fewer than 3 treatments, were under 18 years old, and/or were lost to follow-up. The remaining 100 patients were included in the study.

Clinical examination

Demographics, clinical history, examination findings (vision, intraocular pressure, Schirmer I test with anaesthesia, tear break up time [TBUT], eyelid and facial vascularity, eyelid margin edema, meibomian gland oil flow, and quality score), and ocular surface disease index (OSDI) scoring data were collected from the record of each visit. The treating physician scored the facial vascularity, eyelid margin telangiectasia, and eyelid edema on a scale of 0–4, with 0 being absent and 4 being the most severe. Oil quality was scored on a 1 to 4 scale, 1 representing normal oil and 4 representing solid meibum (i.e., toothpaste-like), as previously described by Mathers et al.¹⁸ The average of the gland function in each quadrant

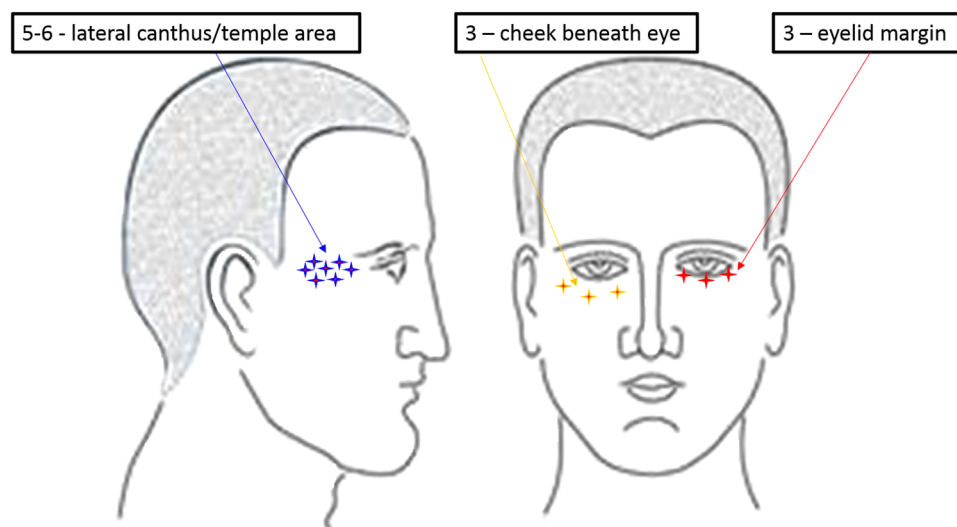


Fig. 1—Intense pulsed light treatment area: the hand piece is placed at each of the highlighted areas for a total of 10–15 treatment spots, which is then repeated in a second pass. Ultrasound gel is placed before treatment, and care is taken to maintain proper eye shield protection.

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