MEDICAL POLICY

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MEDICAL POLICY DETAILS	
Medical Policy Title	**Management of Dry Eye Syndrome and Meibomian Gland Dysfunction (e.g., LipiFlow)**
Policy Number	**9.01.19**
Category	**Technology Assessment**
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Product Disclaimer	• *Services are contract dependent; if a product excludes coverage for a service, it is not covered, and medical policy criteria do not apply.* • *If a commercial product (including an Essential Plan or Child Health Plus product), medical policy criteria apply to the benefit.* • *If a Medicaid product covers a specific service, and there are no New York State Medicaid guidelines (eMedNY) criteria, medical policy criteria apply to the benefit.* • *If a Medicare product (including Medicare HMO-Dual Special Needs Program (DSNP) product) covers a specific service, and there is no national or local Medicare coverage decision for the service, medical policy criteria apply to the benefit.* • *If a Medicare HMO-Dual Special Needs Program (DSNP) product DOES NOT cover a specific service, please refer to the Medicaid Product coverage line.*

POLICY STATEMENT

I. Based upon our criteria and assessment of the peer-reviewed literature, the use of eyelid thermal pulsation therapy (e.g., LipiFlow) to treat dry eye syndrome has not been medically proven to be effective and, therefore, is considered **investigational**.

II. Based upon our criteria and assessment of the peer-reviewed literature, the use of tear film imaging (i.e., LipiView Ocular Surface Interferometer) to evaluate dry eye syndrome and meibomian gland dysfunction has not been medically proven to be effective and, therefore, is considered **investigational**.

III. Based upon our criteria and assessment of the peer-reviewed literature, the use of near-infrared dual imaging (i.e., LipiScan Dynamic Meibomian Imager) to evaluate meibomian glands has not been medically proven to be effective and, therefore, is considered **investigational**.

Refer to Corporate Medical Policy #11.01.03 Experimental or Investigational Services

DESCRIPTION

Dry eye syndrome refers to a group of disorders resulting from either reduced production of the aqueous component or increased evaporation to the aqueous component of the eye. The pathophysiology of the latter condition, also known as evaporative dry eye (EDE), includes lid-related causes such as meibomian gland dysfunction (MGD) and blink problems, as well as ocular surface-related causes including mucin and contact lens dysfunction. MGD is a leading cause of dry eye throughout the world. As such, the Tear Film and Ocular Surface Society (TFOS) held an International Workshop on MGD to reach consensus on the following definition: MGD is a chronic, diffuse abnormality of the meibomian glands, commonly characterized by terminal duct obstruction and/or qualitative/quantitative changes in the glandular secretion. It may result in alteration of the tear film, symptoms of eye irritation, clinically apparent inflammation, and ocular surface

disease. MGD typically results from increased keratinization of ductal epithelium, combined with increased viscosity of meibum.

Meibomian glands are large sebaceous glands present in eyelids. They secrete lipids that form the superficial layer of tear film to protect the evaporation of the aqueous phase. Several factors, including age, diet, sex hormones, antibiotic usage, and the dysfunction of Meibomian glands, can alter the composition of lipids and proteins in meibum, resulting in altered tear film stability and function.

Treatment of MGD often involves a combination of therapies, including the application of heat to the eyelids using warm compresses, with or without manual massage to melt the abnormal meibum and facilitate its reentry into the tear film. Lipid-based artificial tears are used to restore thin or irregular lipid layers and facilitate temporary relief of symptoms. Pharmaceutical options include essential fatty acid supplementation, systemic tetracycline and azithromycin, topical antibiotics and corticosteroids, and topical tacrolimus ointment for refractory cases. Mechanical intervention involves debridement of eyelid margins and various methods to forcibly express abnormal meibum, with or without prior heating. In patients with severe terminal duct obstruction, conductive thermal pulsation treatment of the eyelids has been demonstrated to improve symptoms of MGD.

RATIONALE

LipiFlow

Eyelid thermal pulsation is a proposed treatment option for MGD, which is well recognized as the leading cause of dry eye syndrome. The treatment simultaneously applies heat to the palpebral surfaces of the upper and lower eyelids directly over the meibomian glands while also applying graded pulsative pressure to the outer eyelid surfaces, resulting in expression of the meibomian glands.

The LipiFlow (TearScience Inc, Morrisville, NC) thermal pulsation system received U.S. Food and Drug Administration (FDA) approval in 2010 and is indicated for "the application of localized heat and pressure therapy in adult patients with chronic cystic conditions of the eyelids, including MGD, also known as EDE or lipid deficiency dry eye." The system consists of a component that is inserted around the eyelids and a component to control the application of heat and pressure to the to the palpebral surfaces of both upper and lower eyelids. The inner portion of the apparatus applies a constant temperature of between 41°C and 43°C to the palpebral conjunctiva of the upper and lower eyelids. Simultaneously, the outer portion of the apparatus massages the outer eyelids from the base of the meibomian glands in the direction of the gland orifices, applying pulsatile pressure to the external eyelid surfaces (maximum 6 psi) for the 12-minute treatment cycle, expressing the meibomian glands during heating. The source of heat is a resistive (plastic) electric heater. Initial clinical studies revealed a single 12- minute treatment with the LipiFlow system is effective in patients with MGD.

The iLux System (Tear Films Innovations, Inc, San Diego, CA) received 510(k) marketing clearance in 2016. The iLux System is indicated for "the application of localized heat and pressure therapy in adult patients with chronic diseases of the eyelids, including MGD, also known as EDE." This device consists of a hand-held instrument coupled to a single-use sterile disposable component that is positioned behind the eyelid. The iLux System allows the eye care professional (ECP) to view the eyelid margin through a magnifier, then warm the eyelid tissue to a target range of 40 to 42 ºC to melt the meibum blocking the gland orifices and then apply compression to the eyelid to express the melted meibum through the orifices. The inner eyelid temperature and amount of force applied are both displayed on the instrument allowing the ECP to titrate both heat and compression to optimize unclogging of the blocked gland. The source of heat is lime-green and infrared optical radiation produced by LEDs in the instrument. Treatment of upper and lower eyelids is sequential and treatment time is typically between eight and twelve minutes.

A randomized controlled clinical study (Tauber 2020) was conducted to verify that the technological differences between the iLux System and the LipiFlow System do not adversely affect safety and effectiveness as it relates to indications for use. A total of 142 subjects (284 eyes) participated in the study, comprised of 101 women and 41 men, ages 19 to 86 years (mean = 54.9 ± 15.3 years). The subjects were randomized for treatment, in a 1:1 ratio into the iLux and LipiFlow treatment groups. The iLux arm of the study met the criteria for non-inferiority relative to the LipiFlow arm for the coprimary effectiveness endpoints – Meibomian Gland Score (MGS) and Tear Break-Up Time (TBUT) as well as the

secondary effectiveness endpoint – Ocular Surface Disease Index (OSDI). MGS improved significantly from baseline in both treatment groups at both week 2 and week 4. MGS improvements did not differ significantly between the two treatment groups at either follow-up visit.

In a 2012 non-randomized clinical trial, Zhao et al. conducted a three-month single-institution trial comparing two warming methods in patients with MGD. A total of 50 patients were included in the study, 25 patients who underwent a single 12-min treatment session of thermal pulsation treatment, and 25 patients who underwent warm compresses applied for 10 min sessions twice daily for three months. Researchers concluded that in Asian patients with MGD, LipiFlow thermal pulsation demonstrated similar efficacy to twice daily warm compresses in reducing irritation symptoms and TBUT improvements. Both forms of treatment were safe and well tolerated. In addition to the low sample size, three participants from the warm compress group as well as one patient from the treatment group were lost to follow-up.

In an industry funded 2012 prospective, open label, randomized, crossover multicenter clinical trial, Lane et al. evaluated the safety and efficacy of the LipiFlow system compared to the iHeat Warm Compress (WC) for adults with MGD. A total of 139 patients were randomized to either the LipiFlow (n=69) and WC control group (n=70) and either received a single 12-minute LipiFlow treatment or two-week period of daily five-minute sessions of iHeat treatment, respectively. All treatment subjects were examined at day one, two weeks and four weeks, while WC subjects were given the option of entering LipiFlow cross-over arm at the two-week follow-up. Outcome measures included MG assessment, TBUT and dry eye symptoms. Additional safety outcomes such as adverse events, ocular health exam, ocular surface staining, intraocular pressure, visual acuity, and discomfort were also monitored. The results demonstrated a significant improvement in MG secretion and TBUT at two and four weeks in the LipiFlow group, as well as similar improvements in cross-over arm at two weeks post-treatment. No such improvements were demonstrated in WC group, however. Additionally, LipiFlow resulted in a greater significant reduction in dry eye symptoms than the iHeat WC. There were no significant differences between groups in the incidence of non-serious device-related adverse effects. Researchers concluded the LipiFlow System was equally safe and significantly more effective than iHeat WC in the treatment of MGD and dry eye symptoms. As this study was funded by the manufacturer of LipiFlow and included an open-label design, the potential for investigator bias exists. Short follow-up period poses an additional limitation to this study.

Pang et al. (2019) conducted a systematic review and meta-analysis of randomized controlled trials that compared the efficacy of vectored thermal pulsation treatment (VTPT) and warm compress treatment (WCT) in treating dry eye disease (DED). The primary outcome of gland function, as well as secondary outcomes of TBUT, Schirmer test, tear osmolarity, lipid layer thickness (LLT), Standard Patient Evaluation for Eye Dryness and improvement of subjective symptoms evaluated by the OSDI were examined. The study analysis consisted of four trials with a total of 385 patients. The analysis revealed a significantly greater improvement was observed in meibomian gland function, tear breakup time, and Standard Patient Evaluation for Eye Dryness at two to four weeks in the VTPT group than in the WCT group. A significantly greater decrease in OSDI was observed at two to four weeks and three months in the VTPT group than in the WCT group. Researchers concluded that a single 12-minute VTPT was more effective than traditional WCT in treating both objective and subjective measurements of DED. These findings require confirmation in randomized controlled trials with larger patient populations and longer treatment effect evaluation. Further, this meta-analysis highlights that many studies of VTPT are conducted in participants with mean age of 45-65, thus limiting the validity of data in a younger adult population. Additionally, authors acknowledged that it could not be confirmed whether WCT was conducted per protocol by participants assigned to that arm of included studies.

Additionally, clinical trials evaluating eyelid thermal pulsation for the treatment of MGD and dry eye symptoms are generally small sized with short-term follow-up periods of up to three months post-procedure (Finis et al., 2014 and Baumann and Cochener, 2014). The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

The America Academy of Ophthalmology released a Technology Assessment (2023) stating according to the current literature, a single application of thermal pulsation was safe and usually demonstrated a benefit at least comparable with standard daily warm compress therapy and eyelid hygiene in patients with MGD and dry eye. Patients from White or Asian populations experienced both subjective benefits (as measured by validated questionnaires) and objective

improvement in the health of the eyelids and ocular surface compared with nontreatment for several months after a single thermal pulsation session. Four of the included studies were sponsored and directly supported by relevant industry and raise concern over potential conflict. The three (3) level I studies without direct industry participation concluded that thermal pulsation treatment was not significantly different from eyelid hygiene control treatment. The durability beyond several months and cost efficacy remain uncertain. Because the inclusion parameters of this assessment captured only the LipiFlow system, the conclusions are limited to that product. Independent, unbiased studies of different thermal pulsation treatment frequencies and controlled studies of other thermal pulsation platforms in diverse populations are warranted to assess the long-term benefits of this intervention.

A Cochrane Database Systematic Review (Pucker AD et al., 2024) was conducted to evaluate the effectiveness of LipiFlow for treating dry eye disease (DED) signs and symptoms and the safety of LipiFlow compared with sham or other available treatments for MGD in adults. Thirteen trials were included that randomized a total of 1,155 participants (28 to 236 participants randomized per study). There was no evidence of a difference in meibomian gland expression, meibum quality, or tear breakup time when comparing LipiFlow with basic warm compresses. When comparing LipiFlow plus eyelid hygiene with eyelid hygiene alone, there was no evidence of difference in signs or symptoms at any time point evaluated. The authors concluded the systematic review shows that LipiFlow performs similarly to other commonly used DED treatments with regard to DED signs and symptoms. The best available evidence was deemed to have a high level of bias, leading to low or very low certainty evidence. Additional research with adequate masking, a standardized testing methodology, and a sample representative of the MGD population is therefore needed before any firm conclusions can be drawn regarding comparative benefits and harms.

LipiView

The LipiView II Ocular Surface Interferometer (TearScience Inc, Morrisville NC) received 510(k) marketing clearance in 2015 and is indicated "for use by a physician in adult patients to capture, archive, manipulate and store digital images of the tear film, meibomian glands, ocular surface and eyelids." LipiView II, like its predicate LipiView, perform the same principal functions of ocular imaging and for specular observations of the tear film using white light interferometry. Neither device provides a diagnosis.

While there are many studies employing LipiView ocular surface interferometer to assess LLT, there is little research validating its validity as a clinical tool. Zhao et al. (2015) evaluated the repeatability of LipiView in measuring LLT in twenty Asian subjects. Two investigators measured LLT of one eye of each patient three times in a single day. The results indicated similar limits of agreement for inter-observer and intra-observer measurements. Given the small sample size, repeatability of measurements in different patient subgroups could not be assessed, nor could results be generalized to patients with characteristics that vary from this small sample.

LipiScan

LipiScan Dynamic Meibomian Imager (TearScience Inc, Morrisville NC) received 510K marketing clearance in 2018 and is indicated for "use by a physician in adult patients to capture, archive, manipulate and store digital images of the meibomian glands." It used near infrared (NIR) illumination and an NIR-sensitive high-resolution camera to image the meibomian glands. LipiScan can be used to detect structural changes of meibomian glands, however, there is a lack of evidence demonstrating the efficacy of near-infrared dual imaging in the management of MGD.

CODES

- *Eligibility for reimbursement is based upon the benefits set forth in the member's subscriber contract.*
- *CODES MAY NOT BE COVERED UNDER ALL CIRCUMSTANCES. PLEASE READ THE POLICY AND GUIDELINES STATEMENTS CAREFULLY.*
- *Codes may not be all inclusive as the AMA and CMS code updates may occur more frequently than policy updates.*
- *Code Key: Experimental/Investigational = (E/I), Not medically necessary/ appropriate = (NMN).*

CPT Codes

Code	Description
0207T **(E/I)**	Evacuation of meibomian glands, automated, using heat and intermittent pressure, unilateral
0330T **(E/I)**	Tear film imaging, unilateral or bilateral, with interpretation and report *(e.g., LipiView Ocular Surface Interferometer)*
0507T **(E/I)**	Near-infrared dual imaging (e.g., simultaneous reflective and trans-illuminated light) of meibomian glands, unilateral or bilateral, with interpretation and report
0563T **(E/I)**	Evacuation of meibomian glands, using heat delivered through wearable, open-eye eyelid treatment devices and manual gland expression

HCPCS Codes

Code	Description
	none

ICD10 Codes

Code	Description
H02.8	Other disorders of eyelid (Meibomian Gland Dysfunction)
H04.121-H04.129	Dry eye syndrome (code range)

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*Key Article

KEY WORDS

Dry eye, meibomian gland secretion, eyelid thermal pulsation, near-infrared dual imaging, tear film imaging, MGD, DED

CMS COVERAGE FOR MEDICARE PRODUCT MEMBERS

Based on our review, LipiFlow or management of meibomian gland dysfunction is not addressed in National or Regional Medicare coverage determinations or policies.