Dynamic Intraductal Meibomian Probing: A Modified Approach to the Treatment of Obstructive Meibomian Gland Dysfunction

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Purpose: Obstructive meibomian gland dysfunction is a leading cause of ocular morbidity and its treatment remains a challenge. Meibomian gland probing was initially described in 2010. Here, the authors describe a modified technique, dynamic intraductal meibomian probing, which offers several advantages over the traditional approach including increased magnification, greater eyelid stabilization, enhanced anesthesia, and easier identification of gland orifices through the expression of meibum.

Methods: The authors conducted a retrospective chart review of 70 eyelids with treatment-resistant obstructive meibomian gland dysfunction undergoing dynamic intraductal meibomian probing between January 2013 and April 2015.

Results: Immediately after the procedure, 91.4% of cases experienced symptomatic improvement, and no complications were noted.

Conclusions: Dynamic intraductal meibomian probing is an effective and safe treatment for obstructive meibomian gland dysfunction that is resistant to traditional therapies.

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Obstructive meibomian gland dysfunction (OMGD) is a leading cause of evaporative dry eye and among the most common disorders treated by ophthalmologists.[1] Obstructive meibomian gland dysfunction involves abnormal lipid composition of the meibum, causing decreased flow and meibomian gland inflammation.[2] The common treatment goal in OMGD is to improve the flow of meibomian gland secretions.

Intraductal meibomian gland probing is a technique used to enable meibum to transit to the gland orifice. It was described in 2010 by Maskin,[3] who performed the procedure on 25 patients and demonstrated that intraductal probing resulted in expression of abnormal meibum. The technique has been shown to be effective in ocular rosacea[4] and severe posterior blepharitis.[5] Furthermore, intraductal probing has been shown to improve meibomian gland lipid levels,[6] ocular surface disease index score,[7] and tear film stabilization.[8] Here, the authors describe a modified technique, dynamic intraductal meibomian probing (DIMP), and report initial outcomes using this new approach.

METHODS

Surgical Technique. The patient is reclined supine on a surgical chair, and an operating microscope is positioned over the target eyelid. From the surgical experience, optical magnification of 10× to 16× is most useful for anatomical definition at the eyelid margin while also providing a broad enough field of view for the maneuvers of the procedure. Topical proparacaine is administered to the ocular surface and a corneal protective shell is placed. A cotton pledget soaked in 4% lidocaine is placed in the appropriate fornix for 5 minutes. Next, 1% lidocaine with 1:100,000 epinephrine is injected using a transconjunctival approach into the fornix centrally, medially, and laterally. Supplemental subcutaneous injection near the eyelid margin is also administered.

After anesthesia is achieved, von Graefe fixation forceps are used to grasp the target eyelid at the peripheral limit of the tarsal plate. Traction is applied toward the eyelid margin in a "milking" manner. This maneuver often expresses meibum from the glands and enhances the visualization of orifices. Using the dominant hand, a sterile Maskin probe handle with a 2 mm beveled solid stainless steel probe (Rhein Medical, St. Petersburg, FL) is used to dilate each orifice sequentially along the eyelid margin. The probe is passed into orifices perpendicular to the eyelid margin. The 4 mm probe is then substituted to allow for deeper probing. When intraductal resistance is encountered (representing fibrovascular tissue), the operator would feel a "pop" sensation as the probe passes through and relieves the obstruction. The probe could then be passed without resistance. This would often be followed by meibum expression through the orifice, and this likely represents sequestered meibum behind the obstruction now freed up to communicate with the orifice. Video 1 (Supplemental Digital Content 1, available at http://links.lww.com/IOP/A156) demonstrates the DIMP procedure.

Data Collection. After obtaining institutional review board approval, a retrospective chart review was performed on a cohort of patients undergoing DIMP by 1 physician (F.S.) between January 2013 and April 2015. Inclusion criteria were patients with symptomatic OMGD who had not responded to at least 4 weeks of conservative therapy including warm compresses, eyelid hygiene, and topical anti-inflammatory medications. The authors reviewed the electronic medical records for symptoms during the full extent of follow up after treatment. The study was compliant with the Health Insurance Portability and Accountability Act, with protection of individually identifiable health information.

RESULTS

A total of 70 eyelids from 41 patients (16 males, 25 females) were identified. Patients ranged in age from 27 to 92 years (mean 57.4 years).

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Both the authors had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Both the authors have made significant contributions to the conception of this study, the preparation of this manuscript, and final approval of the version to be published.

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The left lower eyelid was treated most frequently (25), followed by the right lower eyelid (22), right upper eyelid (13), and left upper eyelid (10). Primary symptoms before treatment are presented in Table.

The follow-up period ranged from 1 to 64 weeks (mean 12.9 weeks). Sixty-four treatments (91.4%) resulted in subjective relief immediately after the procedure, typically within 1 week. These patients reported an improvement or resolution of their primary symptom. The remaining 6 cases (8.6%) did not result in immediate symptom relief.

Long-term follow up was defined as at least 24 weeks (6 months) of available follow-up data. Thirteen eyelids had results from long-term follow up. Of these, 9 (69.2%) became symptomatic again at some point during follow up. The average time to symptom reappearance was 38.2 weeks since initial surgery. One patient underwent retreatment of the same eyelid because of relapse in symptoms, and this was performed 52 weeks after initial treatment. All patients tolerated the procedure well with no complications.

Patients described qualitative improvements after the procedure. Common experiences included "decreased itching and irritation," "ability to read better and more clearly," "decrease in the redness of the eyelid margins," and "decreased thickness of the eyelids."

DISCUSSION

Untreated, OMGD may lead to significant ocular morbidity. Lipase breakdown of stagnant meibum leads to free fatty acids, triggering inflammation.[9] Clinical findings include dry eye, margin telangiectasia, margin thickening, pruritis, trichiasis, and distichiasis. Over time, fibrosis leads to eyelid contour irregularity and cicatricial entropion.[10]

Traditionally, OMGD is treated with warm compresses and eyelid hygiene to facilitate the expression of obstructed secretions. Topical and oral anti-inflammatory agents are used to decrease the inflammatory response. While these approaches are sometimes effective for OMGD,[11,12] they do not provide lasting symptom relief, particularly in advanced cases of OMGD with eyelid margin fibrosis. Anti-inflammatory agents have additional limitations. Long-term use may be inconvenient and expensive for patients. Steroids may cause an unsafe rise in intraocular pressure. Oral anti-inflammatory agents include the tetracycline class of medications, which are often associated with gastrointestinal disturbances and photosensitivity. As a result, the treatment of chronic OMGD remains a challenge.

Intraductal meibomian gland probing was initially described with a patient sitting upright at the slit lamp.[3] The DIMP approach offers several advantages over the traditional technique. First, the use of an operating microscope offers a greater range of magnification of the eyelid margin and therefore facilitates probing compared with the slit lamp. Also, with the patient in the supine position, the head is stabilized on a headrest and the eyelid does not fall out of focus as may occur if the patient pulls back from the slit lamp. Second, anesthesia with a lidocaine-soaked cotton pledget and injection eliminates patient discomfort, which is often present with topical anesthesia. Third, a protective shell is placed over the cornea, shielding the patient from microscopic light. Finally, the use of von Graefe fixation forceps offers several advantages. The surgeon's nondominant hand uses the forceps to stabilize the eyelid, fixing the orifice in place. The surgeon also creates upward traction, facilitating the insertion of probes against intraductal resistance. Gentle squeezing along the eyelid margin with the forceps allows for expression of thickened meibum. This maneuver identifies the exact location of the orifices, which are sometimes obscured by the eyelid margin changes, by using the meibum squeezed to the margin as a landmark. This permits more complete probing of all orifices and decreased pain to patients caused by erroneous probing of tissue between orifices.

There are several limitations to this study. First, this study was retrospective and the authors did not have a control group. Patients may have experienced symptomatic improvement of their OMGD without probing, and DIMP may have only accelerated this course. However, the patient's all received at least 4 weeks of conservative therapy without improvement and relief after probing was rapid, suggesting a likely beneficial role of the intervention. The expression of meibum with eyelid fixation and probing suggests that obstruction is reversible with probing but not warm compresses and eyelid hygiene, which have been tried for many weeks. Attempts to evacuate the duct using pressure and heat before probing may theoretically increase intraductal pressure behind the obstruction, exacerbating symptoms. Second, several patients had available follow up for only 1 week after the procedure. Although this time period does not reflect the long-term course of a chronic disease process, the authors consider symptomatic relief after 1 week to be an important measure in patients with a treatment-resistant disease process. It may have been the case the patients with subjective long-term improvement did not follow up in clinic, therefore skewing the long-term data toward dissatisfied patients. Only 13 eyelids had results for long-term follow up (at least 24 weeks). Finally, the authors evaluated relief after the procedure subjectively by asking patients during follow up if their symptoms have improved. An objective measure of meibomian gland function such as meibometry was not available at the time of the study, but such techniques would certainly be valuable for future studies.

Overall, patients were extremely satisfied with the results of DIMP and 91.4% described subjective symptomatic improvement during follow up. Dynamic intraductal meibomian probing is an effective and safe treatment for OMGD that is resistant to traditional therapies. Prospective randomized trials comparing DIMP to other OMGD therapies would be beneficial.

Primary symptom at presentation

Symptom	Number (%)
Pain	33 (47.1)
Foreign body sensation	10 (14.3)
Tearing	8 (11.4)
Dryness	7 (10)
Itching	7 (10)
Burning	3 (4.3)
Crusting	2 (2.9)

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