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*Case Report*

# Microblepharexfoliation Applied to a Recurrent Stye Associated with Demodex: A Clinical Case

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**Abstract**

A clinical case is presented of a patient with a recurrent external hordeolum in the left eye, attended at the Optometric Diagnostic Center.

Objective: To verify the effectiveness of microblepharoexfoliation in recurrent external hordeola associated with Demodex.

Method: Evaluation performed according to the care protocol of the Optometric Diagnostic Center.

Results: Microblepharoexfoliation showed a reduction in Meibomian gland obstruction, as well as a decrease in the Demodex mite count.

**Keywords:** Hordeolum; Stye; Microblepharexfoliation; Demodex

## Introduction

An external stye is an acute inflammation of the eyelid, secondary to the obstruction of the glands that produce meibum (Meibomian or Zeiss). It has been historically accepted that this disorder is caused by a bacterial infection, 90% to 95% of which is caused by *Staphylococcus aureus* [1]. Since 2014, nonetheless, there is consensus that the recurrence of styes is associated with Demodex infestation [2]. Two species of these ectoparasites are found in humans: *D. folliculorum*, which measures approximately 0.3 to 0.4 mm in length and its abdomen (opisthosoma) is striated, elongated and can measure up to 7/10 of the total length, it usually inhabits the hair follicle, while *D. brevis*, is smaller (0.2 to 0.3 mm long) and its spans up to 2/3 of its length and it mainly inhabits deep within the meibomian gland. Both species are part of the skin microbiome [3]. The overpopulation of these ectoparasites is known as demodicosis and has been associated with the appearance or worsening of other diseases such as blepharitis, conjunctivitis, basal cell carcinoma of the eyelid, keratitis, chalazion, stye, among others [4]. Therefore, monitoring density and overpopulation is key to identifying the presence of any of the aforementioned diseases, as many patients may go through asymptomatic periods and consequently present tissue damage on the Ocular Surface (OS) associated with demodicosis. Currently, most treatment protocols for Demodex infestation suggest the application of Tea Tree Oil (TTO) as the main therapeutic agent. However, it has been proved that both the use of TTO and ivermectin or other non-ophthalmic acaricidal drugs can cause adverse reactions (references), so their use may not be the best option for some patients.

Alternative non-pharmacological treatments such as microblepharexfoliation have recently been explored. This technique eliminates cellular desquamation and removes traces of bacteria and oil from the edge of the eyelid by means of a device with a rubber that gently spins around the edge of the eyelid and eyelashes. Nowadays, eyelid exfoliators are classified as: Clinical and daily cleansing (NuLids®) and both devices have proved to be effective in significantly reducing *D. folliculorum* and controlling symptoms [5,6]. The above, together with the application of vaporizations, aims to improve the function of the meibomian glands by unblocking them and allowing the abnormal meibum to escape [7,8]. It has been reported that the chemical structure of the meibum in these patients is better in terms of order, its conformation resembling the characteristic rigidity of the hydrocarbon chain present in olive oil and butter, therefore, a temperature higher than 38.5°C and a 45°C peak to avoid discomfort and maintain patient safety, with the aim of achieving a liquidity similar to that of healthy meibum [9,10].

Below is the clinical case of a patient suffering from recurrent external sties in the left eye, treated under the Optometric Diagnostic Center's care protocol. The patient signed an informed consent form based on the Declaration of Helsinki [11].

48-year-old male patient attending the Optometric Diagnostic Center due to photophobia, pain and inflammation in the medial temporal area of the eyelid margin of the left eye. Symptoms have appeared two months earlier and were previously treated with TOBRAMYCIN gelbid15d. During the anamnesis, systemic diseases and allergies were excluded. The patient denied a history of inherited ocular and systemic diseases and referred to being healthy (Fig. 1,2, Table 1-3).

After the examination, the following signs were identified:

| | **Right Eye** | **Left Eye** |
|---|---|---|
| ***Demodex*** | 1.7 average out of 5 eyelashes. | 9 mites on 1 eyelash in the stye area. 2.8 average out of 5 eyelashes. |
| **Ocular Surface Disease Index (OSDI)** | 32 | |

**Table 1:** Results of the OSDI questionnaire and Demodex folliculorum count on eyelashes.

| | **Right Eye** | **Left Eye** |
|---|---|---|
| **Eyelashes** | Cylindrical dandruff at the base of the eyelashes (hyperkeratinization) | Cylindrical dandruff at the base of the eyelashes (hyperkeratinization) |
| **Freeboard** | Obstruction of the Meibomian glands ++ | Obstruction of the Meibomian glands ++ Chronic stye on upper eyelid margin |
| **Tarsal Conjunctiva** | Superficial and deep hyperaemia ++ | Superficial hyperaemia ++ |

**Table 2:** Biomicroscopy report according to the efron grading scales.

| | |
|---|---|
| **Right Eye** | Negative. No presence of bacteria. |
| **Left Eye** | Negative. No presence of bacteria. |

**Table 3:** GRAM staining report.

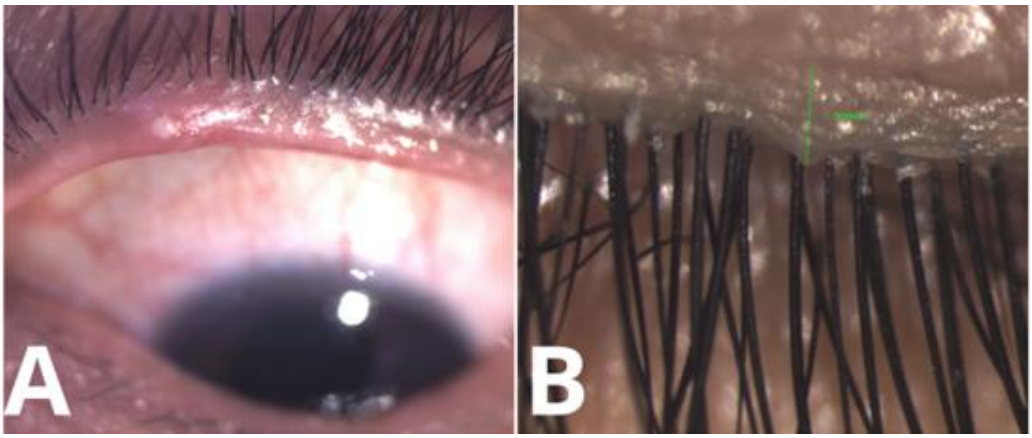


**Figure 1:** In A. Micrograph at 40x magnification showing adult D. folliculorum. In B, a 10x magnification of the left eye in the stye area where at least six D. folliculorum ectoparasites can be seen (green arrows). In C, at 10x magnification, the right eye shows five D. folliculorum ectoparasites (green arrows).

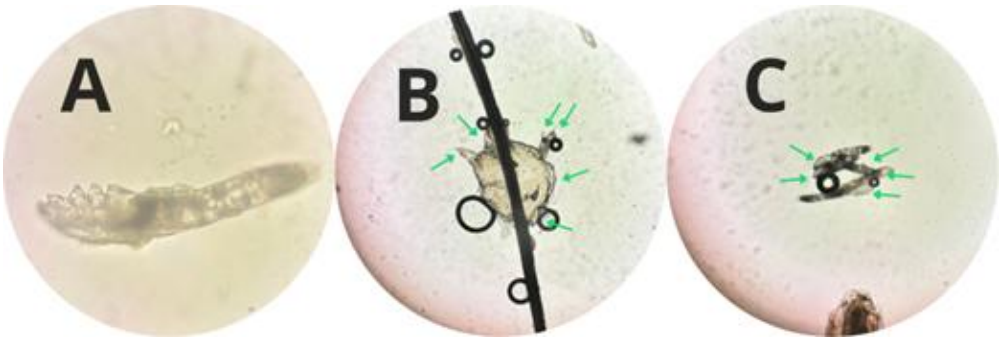


**Figure 2:** In A, a photograph with 10x magnification of the medial-temporal portion of the upper eyelid of the left eye, with an external stye and multiple obstructions of the meibomian glands. In B, a photograph with 40x magnification of the mid-temporal portion of the upper eyelid of the left eye, showing hyperkeratinization at the base of the eyelashes with a height of 0.9 mm.

**Differential Diagnosis**

*Blepharitis*

Blepharitis is a common inflammatory condition of the edge of the eyelids, associated with itching, redness, flaking and scabbing of the eyelids. Observed in both sexes and at all ages. This alteration can be associated with bacteria, viruses or parasites. Different authors classify blepharitis according to its anatomical location, with anterior blepharitis causing inflammation at the base of the eyelashes. This alteration is commonly called *staphylococcal blepharitis*, due to the bacteria with which it is related [12]. In between 92% and 97% of patients, the causative agent identified was *Staphylococcus epidermis* [13]. The main signs are erythema and edema of the eyelids, telangiectasia of the anterior eyelid, flaking of the eyelashes and the formation of rings of lashes around the base of the eyelashes, in severe cases trichiasis, poliosis, madarosis and ulceration of the eyelids [14].

*Conjunctival Granuloma*

A conjunctival granuloma or chalazion is a chronic inflammatory lesion that forms when lipid degradation products seep into the surrounding tissue and induce a granulomatous inflammatory response, caused by inflammation of the sebaceous glands of the eyelids. A chalazion tends to be deeper within the tarsal layer than that of styes, the latter being in the chronic phase (15). Treatment is commonly based on the use of topical antibiotics and steroids, even if the inflammation persists, the administration of both drugs is done systemically.

*Bacteria-Produced Stye*

A stye is a soft, erythematous swelling or inflammation that usually resolves spontaneously. Often caused by *Staphylococcus aureus*, which infects the hair follicle of the eyelashes, causing inflammation and pain in the affected area, which if left untreated can progress to a pustule and cause pain when blinking or being touched (1 and 16).

*Stye Produced by Demodex*

The obstruction of the sebaceous glands by Demodex without treatment causes marginal hyperemia, flaking, scabbing and marginal hypertrophy in chronic lesions without treatment. A pathognomonic sign of Demodex overpopulation is hyperkeratinization of the base of the eyelashes. The diagnosis is made by obtaining eyelashes from areas surrounding the stye in order to analyze the presence of these ectoparasites under a microscope [17].

*Definitive Diagnosis*

Recurrent stye in the medial temporal portion of the upper eyelid of the left eye associated with ectoparasites with previous treatment with tobramycin.

*Treatment*

Sodium Hyaluronate, free of conservative agents, in both eyes every eight hours for 20 days. Clean eyelids with towels and eyelid foam (tea tree oil) twice a day. Microblepharexfoliation (NuLids®) every three days with a total of five sessions previously applying vaporization for 5 minutes.

**Results**

The study included 20 patients followed for infectious embryo-fetopathy, representing 40 eyes. Males were the most represented sex, comprising 55% (n=11) of the study population, with a sex ratio of 1.2. The mean age was 39 months (3 years and 3 months) ± 25 months [2 months, 9 years] and the median age was 36 months. The age group from 24 months (2 years) to 60 months (5 years) was the most represented (Fig. 3-5, Table 4).


**Figure 3:** Photographs with 10x magnification of the evolution of the stye in a medium temporal portion of the upper eyelid of the left eye with 10x. In A, first visit, meibomian gland obstruction +++, where white meibum is visible to the naked eye, generalized free edge hyperemia ++. In B, second visit, meibomian gland obstruction +++, transparent meibum is observed, hyperemia ++ in areas close to the stye. In C, third visit, meibomian gland obstruction ++, transparent meibum, hyperemia ++ in areas close to the stye. In D, fourth visit, meibomian gland obstruction ++, transparent meibum, hyperemia + in areas close to the stye. In E, fifth visit, no meibomian gland obstruction, + hyperemia in areas close to the stye.

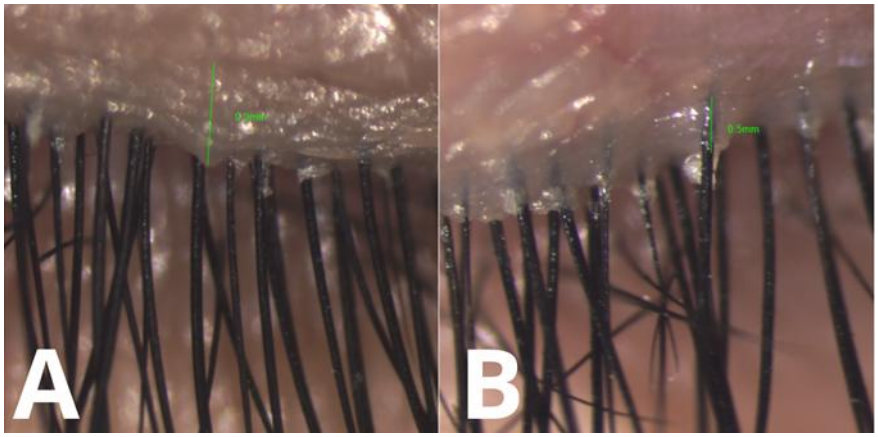


**Figure 4:** Photographs with 40x magnification of the medium temporal portion of the upper eyelid of the left eye. In A, first visit, hyperkeratinization at the base of the eyelashes with a height of 0.9 mm. In B, fifth visit, less dense hyperkeratinization at the base of the eyelashes reaching a height of 0.5 mm.

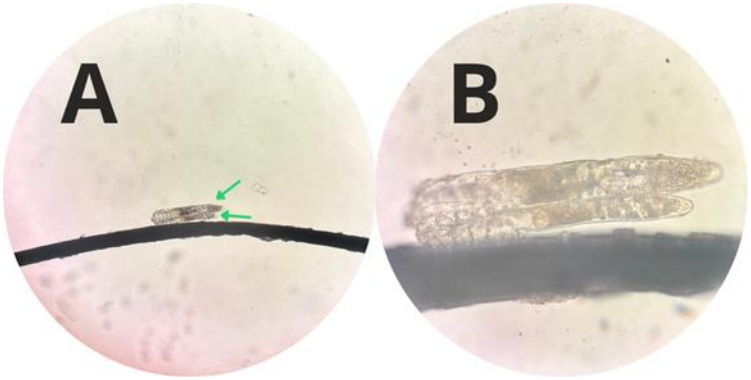


**Figure 5:** In A, a 10x magnification of the left eye in the stye area, where at least six *D. folliculorum* ectoparasites can be seen in B. Micrograph at 40x magnification showing adult *D. folliculorum*.

| | Right Eye | Left Eye |
|---|---|---|
| ***Demodex*** | 0.2 average out of 5 eyelashes. | 2 mites on 1 eyelash in the stye area. 0.5 average out of 5 eyelashes. |
| **OSDI** | 17 | |

**Table 4:** Results of the OSDI questionnaire and *Demodex folliculorum* count on eyelashes at the end of treatment.

The treatment showed a reduction in the obstruction of the meibomian gland, a decrease in the hyperemia of the free edge; the hyperkeratinization decreased in density along with the count of ectoparasites. In addition, a change in the coloration of the meibum from yellowish white to transparent was observed, showing a significant improvement in the previous objective diagnostic techniques.

**Discussion**

*Demodex ectoparasites* are part of the skin microbiome. Various studies have proven that overpopulation is associated with different ocular alterations such as chronic blepharitis, conjunctival inflammation, Meibomian gland dysfunction, chalazion and stye. Furthermore, this has been related to systemic pathologies such as basal cell carcinoma, immunosuppression (Behcet's syndrome, non-Hodgkin's lymphoma, lymphocytic leukemia), gestational diabetes and allergic rhinitis [16,17]. 67% of styes are associated with *Demodex folliculorum* [17]. *D. folliculorum* and *D. brevis* do not cohabit, but they can be found in the same gland causing obstruction in the glands that produce meibum due to the accumulation of their decomposing remains and the excess chitin a protein present in the exoskeleton of the ectoparasite, causing changes in the composition of the meibum [17,18].

The most used treatment for styes is topical antibiotics, which show an improvement in symptoms in most cases [17]. This may be because Demodex acts as a vector for pathogenic microorganisms that promote infection in the meibomian glands, including *Staphylococco spp, Streptococco spp* and *Bacilus oleroius*, promoting the proliferation of bacteria and the appearance of blepharitis [13,18]. Nevertheless, in the present clinical case the patient did not notice any improvement after a course of antibiotics and the GRAM stain analysis of the sample did not reveal any bacteria. Blepharitis was ruled out due to the absence of secretion and the presence of hyperkeratinization at the base of the eyelashes, a pathognomonic sign of Demodex infestation.

Hence, clinical management was based on microblepharoexfoliation (NuLids®) since, as previously mentioned, this technique has proved to reduce symptoms and the number of mites and hyperkeratinization caused by the overpopulation of *D. folliculorum* [19,20]. Hyperkeratinization is triggered by the waste products of the mites associated with the consumption of epithelial cells from the eyelids; producing microabrasions when scraping the inner walls of the eyelash follicles with their claws, which results in follicular distension, epithelial hyperplasia and reactive hyperkeratinization visible at the base of the eyelashes, also known as cylindrical dandruff [21].

## Conclusion

The recurrence of styes in the same area or close to the eyelid after different treatments, including incision and curettage, requires the application of specific diagnostic techniques such as the identification of Demodex mites in the eyelash follicle by microscopic observation, where the quantification of an average of 1.7 mites out of 5 eyelashes can support the diagnosis of recurrent stye. In our experience, microblepharophotexfoliation (NuLids®), previously applying eyelid vaporizations in patients diagnosed with Demodex-associated styes, boosts the elimination of hyperkeratinization, as well as the exit of meibum and, consequently, an improvement in the chronic signs and symptoms presented by the patient is observed. This is because delaying a correct diagnosis promotes the development and maintenance of eyelid tissue degeneration, with its respective implications for the functioning of the eyelids, as well as for the patient's quality of life, as shown in the present clinical case.

## Conflict of Interest

The author declares no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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## Author's Contributions

All authors have contributed equally to this work and have reviewed and approved the final manuscript for publication.

## Consent For Publication

Not applicable.

## Ethical Statement

Not Applicable.

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