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Review Article

Demodex the Enemy Behind Our Lines

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Abstract

Demodex blepharitis is a common ocular condition caused by an infestation of Demodex mites on the eyelids and eyelashes. This brief review provides an overview of the epidemiology, clinical presentation, diagnosis, and management of Demodex blepharitis. The article discusses risk factors associated with the condition, such as age and poor hygiene, and highlights various diagnostic tests that are available. Management strategies, including lid hygiene and medications, are also presented. The review emphasizes the importance of early diagnosis and effective management to improve visual function and minimize ocular discomfort.

Keywords: Demodex; *Demodex folliculorum*; Demodex Blepharitis

Introduction

Demodex is a genus of tiny mites that live on the skin of mammals, including humans. These mites feed on dead skin cells and oil, and are usually harmless. However, an overpopulation of Demodex mites can lead to skin irritation and conditions such as Blepharitis which is a common ocular disease.

Demodex mite usually found in or near the pilo-sebaceous units. *Demodex folliculorum* and Demodex brevis are two species typically found on humans. Demodex infestation usually remains asymptomatic and may have a pathogenic role only when present in high densities and also because of immune imbalance [16]. Thy are most prevalent on the face as they reside within the pilosebaceous units [1].

There are two main types of Demodex: *D. folliculorum* and *D. brevis*. *D. folliculorum* measures 0.3-0.4 mm long and is found in clusters around lash follicles while *D. brevis* measures 0.2-0.3 mm long and is found solely in the sebaceous units and Meibomian glands [6]. Thus, *D. folliculorum* has been associated more closely with anterior blepharitis and *D. brevis* more closely with posterior blepharitis and Meibomian gland dysfunction [18].

Risk factors

It seems that the most important risk factor is increasing age, the prevalence continues to increase with age, with 13% of 3–15-year-olds infested, 69% of 31-50 year olds, 84% by age 60, and 100% after 70 years of age [1,18].

Demodex mites are also prevalent in populations that work with the elderly, as well as in males and individuals with inadequate hygiene practices, such as infrequent facial washing. This can result in an overpopulation of mites and lead to the development of blepharitis. Additionally, a strong connection has been noted between the intensity of rosacea and demodex-associated blepharitis [7].

Demodex are more common in patients who are immunocompromised. In patients with HIV, eruptions generally occur when CD4 count drops below 150/mm^3 [11].

Other Risk Factors include, Skin Phonotype, Sunlight exposure, Alcohol intake, Smoking, Spa, Spicy food, and Hot beverage [7].

Demodex life cycle

The life cycle of Demodex mites is composed of several stages, including the egg, larva, nymph, and adult stages. The entire life cycle of Demodex mites can be completed in about one to two weeks. The dead mites decompose inside the hair follicles or sebaceous glands [4].

Figure 1: Sun Tzu (2015). "The Art of War", p.4, Booklassic.

What exactly do Demodex do?

Demodex mites can cause a range of issues through various mechanisms. These include:

- Occupation and irritation of hair follicles and glands leading to hyperkeratinization and epithelial hyperplasia.
- Consumption of the hair follicle lining by the mites for egg-laying, resulting in the swelling of the follicle and misdirection of eyelashes [7,8].
- Blockage of the Meibomian glands by the mites, causing irritation and dysfunction of the glands (MGD) [9].
- The mites' exoskeleton made of chitin can trigger an inflammatory response and a foreign-body-like reaction, contributing to the formation of chalazia [10].
- The presence of the mites can also stimulate an immune response that is proportional to their number, resulting in an inflammatory cascade [4,19].
- Demodex mites can also serve as carriers of antigens [4,19].

Diagnosis

Patients suffering from blepharitis with Demodex infestation may experience a range of eye conditions that can lead to symptoms such as itching, burning, foreign body sensation, blurred vision, and pain. However, since these symptoms are also common in other disorders, it is essential to gather additional evidence along with a strong clinical suspicion to make a proper diagnosis. Demodex infestation may be considered as a potential cause if the patient reports frequent recurrence of these symptoms despite conventional treatments being ineffective [6].

The symptoms of Demodex blepharitis can vary in severity, but commonly include itching and burning of the eyes, redness and swelling of the eyelids, a gritty and foreign body sensation in the eyes, and brittle and falling eyelashes. In severe cases, the eyelid margins can become thickened and scaly, and patients may suffer from blurry vision.

Slit-lamp exam can be used to detect cylindrical dandruff at the root of the lashes, a pathognomonic sign for Demodex [6,9]. Otherwise, exam findings are typical for the diseases listed above and are therefore non-specific for Demodex.

The common signs of ocular demodex infestation include:

- Cylindrical cuff at the root of eyelashes
- Blepharitis
- Lid margin erythema and inflammation
- Misdirected lashes
- Meibomian gland dysfunction
- Bulbar conjunctiva inflammation
- Corneal infiltration

Figure 2: Photographs demonstrating the typical cylindrical dundraff at the root of the eyelashes (a, red arrow); misdirected lashes (b, blue arrow); meibomian gland dysfunction (c, green arrow); lid margin inflammation (d, black arrow); bulbar conjunctiva inflammation (e); corneal infiltration and pannus (f, yellow arrow).

Jingbo Liu, H. S. (2010). Pathogenic role of Demodex mites in blepharitis. Current Opinion in Allergy and Clinical Immunology, DOI: 10.1097/ACI.0b013e32833df9f4.

Lash sampling is a method for detecting mites through microscopic examination. To conduct the test, lashes are epilated, placed on a glass slide, fluorescein is added on top, and a cover slip is applied before examining under a microscope to detect the presence of mites. In skin biopsy samples, multiple Demodex mites may be observed filling the space in the follicle, surrounded by chronic inflammatory cells [12,18].

As mentioned before, facial rosacea is associated with Demodex blepharitis, as well as pterygia and bacterial infection [4,21].

Management

Effective treatment of Demodex blepharitis typically involves a combination of eyelid hygiene and medication. Eyelid hygiene may include using warm compresses to soften the eyelids, gently massaging them to remove debris and exfoliate the eyelid margins, and applying a diluted baby shampoo or over-the-counter eyelid scrub to clean the eyelashes. In addition, proper eyelash hygiene is important, such as avoiding the use of eye makeup, using a new tube of mascara every 3-4 months, and removing eye makeup before going to bed.

Daily lid scrubs with tea tree oil (TTO) are commonly used to eradicate Demodex infestation. Initially, a therapeutic dose of 50% TTO was used and demonstrated to reduce symptoms and inflammation of the cornea, conjunctiva, and lid margin [14]. However, this concentration caused irritation in some patients, leading to the isolation of terpinen-4-ol (T4O), the active ingredient in TTO. T4O is more potent than TTO at equivalent doses, allowing for effective treatment at lower concentrations [15].

Medication options for Demodex blepharitis may also include topical or oral antibiotics, such as doxycycline or azithromycin, which can help reduce inflammation and kill bacteria associated with the condition. Topical or oral antiparasitic agents, such as ivermectin, may also be used to eliminate the Demodex mites. Other anti-inflammatory drugs, such as corticosteroids, may be prescribed to reduce inflammation and redness in severe cases.

Intense pulsed light (IPL) therapy has been used in the treatment of demodex blepharitis. The purpose of IPL therapy is to reduce the populations of demodex mites on the skin and to reduce the symptoms of blepharitis. It works by delivering intense pulses of light that are absorbed by the mites, leading to their destruction and a decrease in skin populations. In addition, this therapy can help to reduce inflammation and redness caused by the mites [22].

Conclusion

In conclusion, Demodex infestation should be considered in every patient with blepharitis, especially in older patients. Risk factors such as poor eyelid hygiene should be kept in mind. The appropriate treatment plan for Demodex blepharitis typically involves a combination of eyelid hygiene and medication, such as tea tree oil or T4O. In severe cases, IPL may be used to reduce the Demodex population on the eyelids.

The effective treatment of Demodex blepharitis requires a cooperative effort between the patient and healthcare provider. This collaboration is essential to ensure proper diagnosis, management of risk factors, and effective treatment.

Bibliography

1. Elston CA and Elston DM. "Demodex mites". *Clinics in Dermatology* 32 (2014): 739-743.

2. Schear MJ., *et al*. "The Association of Demodex with Chalazia: A Histopathologic Study of the Eyelid". *Ophthalmic Plastic and Reconstructive Surgery* 32.4 (2016): 275-278.

3. Holmes AD. "Potential role of microorganisms in the pathogenesis of rosacea". *Journal of the American Academy of Dermatology* 69.6 (2013): 1025-1032.

4. Zhao YE., *et al*. "Association of blepharitis with Demodex: a meta-analysis". *Ophthalmic Epidemiology* 19.2 (2012): 95-102.

5. Chen W and Plewig G. "Are Demodex Mites Principal, Consipiratory, Accomplice, Witness or Bystander in the Cause of Rosacea?". *American Journal of Clinical Dermatology* 16 (2015): 67-72.

6. Cheng A., *et al*. "Recent advances on ocular Demodex infestation". *Current Opinion in Ophthalmology* 26 (2015): 295-300.

7. Liu J., *et al*. "Pathogenic role of Demodex mites in blepharitis". *Current Opinion in Allergy and Clinical Immunology* 10.5 (2010): 505-510.

8. Nicholls S., *et al*. "Demodex species in human ocular disease: new clinicopathological aspects". *International Ophthalmology* (2016).

9. Gao Y., *et al*. "High prevalence of Demodex in eyelashes with cylindrical dandruff". *Investigative Ophthalmology and Visual Science* 46.9 (2005): 3089-3094.

10. Liang L., *et al*. "High prevalence of Demodex brevis infestation in chalazia". *American Journal of Ophthalmology* 157.2 (2014): 342-348.

11. Yamaoka T., *et al*. "Severe rosacea with prominent Demodex folliculorum in a patient with HIV". *Journal of Dermatology* 41.2 (2014): 195-196.

12. Kheirkhah A., *et al*. "Fluorescein dye improves microscopic evaluation and counting of Demodex in blepharitis with cylindrical dandruff". *Cornea* 26.6 (2007): 697-700.

13. Turqut B., *et al*. "Phthriasis palpebrarum mimicking lid eczema and blepharitis". *Journal of Ophthalmology* 2009 (2009): 803951.

14. Gao Y., *et al*. "Clinical treatment of ocular demodecosis by lid scrub with tea tree oil". *Cornea* 26 (2007): 136-143.

15. Tighe S., *et al*. "Terpinen-4-ol is the Most Active Ingredient of Tea Tree Oil to Kill Demodex Mites". *Translational Vision Science and Technology* 2.7 (2013): 2.

16. Parvaiz Anwar Rather IH. "Human Demodex Mite: The Versatile Mite of Dermatological Importance". *Indian Journal of Dermatology* 59.1 (2014): 60-66.

17. Jingbo Liu., *et al*. "Pathogenic role of Demodex mites in blepharitis". *Current Opinion in Allergy and Clinical Immunology* 10.5 (2010): 505-510.

18. Cat Nguyen Burkat., *et al*. "Demodex Infestation". From EyeWiki (2022).

19. N O'Reilly DB. "Demodex-associated bacterial proteins induce neutrophil activation". *British Journal of Dermatology* 166.4 (2012): 753-760.

20. Jingbo Liu HS. "Pathogenic role of Demodex mites in blepharitis". *Current Opinion in Allergy and Clinical Immunology* (2010).

21. Yukan Huang HH. "Ocular demodicosis as a risk factor of pterygium recurrence". *Ophthalmology* 120.7 (2013): 1341-1347.

22. Tseng SC., *et al*. "The treatment of Demodex blepharitis with intense pulsed light". *American Journal of Ophthalmology* 151.5 (2011): 832-838.