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Treatment of demodicosis: an overview of available therapeutic methods

Laura Sikorska, Żaneta Kipias, Wiktoria Błaszczyk, Kacper Sukiennicki

Faculty of Medicine, Collegium Medicum, Andrzej Frycz Modrzewski University, Krakow
Head: prof. AFMU Janusz Ligęza, PhD

HIGHLIGHTS

Demodicosis is a growing concern in both ophthalmology and dermatology. The key to complete recovery is making a prompt diagnosis and initiating appropriate treatment. Neglecting the condition may lead to chronic inflammation of the eyelid margins.

ABSTRACT

Demodex is a parasitic mite commonly inhabiting human skin. Under conditions of excessive colonization, it can cause demodicosis – a disease manifested by symptoms such as erythema, itching, burning, and inflammation of the eyelid margins. The diagnosis of demodicosis is primarily based on microscopic examination, although non-invasive techniques such as dermatoscopy are also used. Treatment of demodicosis is complex and multi-stage due to the difficulty of completely eliminating the parasite. Pharmacotherapy involves the use of antibiotics, antiparasitic agents (e.g. ivermectin), plant-based preparations (such as tea tree oil), crotamiton, or mercury oxide. Non-pharmacological methods complement the therapy. A key role in prevention is played by eliminating sources of reinfection: changing cosmetics, frequent washing of textiles, and strengthening the immune system. Treating demodicosis requires an individualized approach, consistency, and patience, and the effectiveness of therapy often depends on combining various methods and maintaining strict hygiene.

Key words: demodex, Demodex brevis, Demodex folliculorum

INTRODUCTION

Demodex is a mite that commonly inhabits human skin. Its presence usually does not cause symptoms, however, in the case of intensive colonization it may cause inflammatory states and a skin disease called demodicosis. It manifests in various ways, depending on the location, e.g.: rosacea, erythema, pustular eruptions, feelings of itching and burning, as well as chalazia in the case of involvement of the Meibomian glands [1]. Treatment of this condition is a challenge, because the parasite inhabiting the structures of the skin is difficult to completely eliminate. The aim of the work is to present the available therapeutic methods and their effectiveness in eliminating Demodex and alleviating the symptoms of the disease.

CHARACTERISTICS

Demodex occurs in two main species: *Demodex folliculorum*, which inhabits hair follicles, and *Demodex brevis*, preferring Meibomian glands. The life cycle of the parasite lasts approx. 14 days and includes several stages – from egg, through larva and nymph, to the adult form [1]. Demodex feeds on lipids and dead epidermal cells, which favors the colonization by it of places with increased activity of sebaceous glands. It becomes active at night, therefore the symptoms are then intensified [2, 3]. Demodex is transmitted mainly through direct contact with the skin of an infected person. Indirect infection is also possible through the use of shared towels, pillows or cosmetic accessories [1, 2]. The group of increased risk of infection includes people undergoing immunosuppression, suffering from renal failure and/or diabetes, elderly people, HIV carriers. A separate group consists of patients suffering from cancers of the hematopoietic system (lymphomas and leukemias). Demodicosis has been described in children suffering from acute or chronic lymphoblastic leukemia [4].

DIAGNOSTICS

Proper diagnosis of demodicosis is crucial for the implementation of effective treatment. There are several methods of detecting the presence of the parasite. Microscopic examination consists in collecting eyelashes or material from the surface of the skin and analyzing it in a direct preparation in 20% KOH in order to detect Demodex. There is also a method consisting in taking a direct preparation from sebaceous glands, obtained from hair follicles or with the help of cyanoacrylate glue. The obtained material should be examined using a light microscope under immersion. The least recommended method is skin biopsy, because due to the small amount of material Demodex may not be noticed [5]. Alternative diagnostic methods include, among others, dermatoscopy, the use of a confocal laser microscope, and optical coherence tomography [6].

TREATMENT

Pharmacological treatment of demodicosis includes the use of antiparasitic drugs, antibiotics, antiviral drugs, and plant substances supporting therapy. There are no guidelines regarding treatment, and the effectiveness of therapy depends on systematic use of appropriate preparations and combining them with other therapeutic methods. An additional difficulty in therapy is distinguishing primary demodicosis from secondary [4].

Antibiotic therapy

Antibiotics do not act directly on Demodex, but are used in cases when demodicosis is accompanied by bacterial superinfection or inflammation. Particular caution should be exercised in the case of acquiring resistance to the antibiotic. To prevent such a situation, the given preparation should be used with breaks. Systemically, in severe demodicosis the following are preferred: tetracycline, doxycycline, and in very severe cases minocycline. Another available method of treatment is 10% sodium sulfacetamide in combination with sulfur in the form of creams or gels. Such a combination acts antibacterial and antiparasitic. Tetracyclines allow to obtain good results in the treatment of rosacea and ocular demodicosis. They reduce possible bacterial superinfection caused by *S. epidermidis* and *S. aureus*. As an alternative treatment, azithromycin or erythromycin may be used. In the case of macrolides and tetracyclines, we can observe a positive effect consisting in anti-inflammatory action and reduction of tissue remodeling [2, 6, 7].

Antiparasitic drugs

Ivermectin acts effectively both internally and externally. It is available in oral and topical forms (in the form of creams). Studies have shown that both oral and topical action caused significant or complete eradication of Demodex in people with inflammation of the eyelid margins or rosacea. In the case of resistant eyelid demodicosis, ivermectin proved to be a good therapeutic. It can be used alone or in combination with metronidazole [2, 8].

Crotamiton

In the case described by Wesołowska et al., in a 25-year-old patient skin lesions occurring for 5 years with variable intensity and location were observed. In the initial period of the disease, the lesions occurred on the trunk and had the form of itchy papules and pustules. Then the lesions persisted on the hands and feet. Antihistamine treatment was introduced together with a topical glucocorticosteroid ointment, but no effects of treatment were observed.

At a further stage, scrapings were taken and subjected to observation under a light microscope. A very large number of *D. folliculorum* was demonstrated. Further treatment was implemented, this time with the use of preparations: glucocorticosteroid, exfoliating, and antihistamine in combination with phototherapy (Psorilux). There was still no improvement, so crotamiton was introduced. After a few days, significant improvement was observed, and after 10 days, examinations of the skin of the feet and hands confirmed the absence of Demodex [5].

Preparations with tea tree oil

In some cases, instead of intensive pharmacotherapy, an approach focused on regulation of the microbiological environment of the skin is used, e.g. using gentle preparations based on tea tree oil at a concentration of 5–50% for 4–6 weeks [6]. They act analgesic, anti-edematous, and anti-inflammatory. They are available in the form of liquids, ointments, creams, and gels. They are applied to diseased areas [3]. In studies, 50% tea tree oil and a shampoo based on the same oil were used. It was indicated that the subjects used both preparations for daily care, including the eye area with the help of the shampoo, and also applied massage of the eyelid margins once a week with 50% tea tree oil. The entire therapy lasted 4–6 weeks. In 7 patients out of 9, complete cure was obtained without later recurrences of demodicosis [9–11].

Mercury oxide

The greatest disadvantage of using mercury oxide is its toxicity, which may appear during treatment. An allergic reaction is also possible, which forces a change of treatment. Application of the preparation must be very careful; contact with the mucous membrane of the eye must not occur. The ointment applied in the evening should be thoroughly removed the next day in the morning with careful compliance of eyelid hygiene rules. In a study of exclusive use of mercury oxide (yellow mercury oxide 2%), after a few weeks a reduction of symptoms of inflammation of the eyelid margins was observed, and after 6 weeks the effectiveness of the therapy was 50% [12].

Combined preparations

A combined preparation of the Demoxoft brand was also examined. The aim of the study was to assess the effectiveness and safety of a gel and liquid for washing the eyelid margins in patients with Demodex blepharitis [13]. The preparations consist of such ingredients as: aloe, Spanish sage oil, a patented ingredient based on olive oil, and the popular tea tree oil. For the first 2 weeks, the subjects used both products (the gel once a day at night and the liquid in the morning and evening). In weeks 3 and 4, they used only the liquid for washing the eyelid margins 2 times a day. In weeks 5 and 6, they used both products in the same way as in the first treatment regimen. 21 people took part in the study, and 17 completed it. After 6 weeks, in 26% of the subjects absence of Demodex was observed, and in 53% there was a reduction of colonization. Moreover, a decrease in itching and eyelash loss was observed. The results included alleviation of symptoms of demodicosis along with reduction of the number of Demodex [13].

Non-pharmacological treatment

Non-pharmacological treatment of demodicosis includes various methods supporting elimination of the parasite and improving the condition of the skin and eyes. The contemporary approach includes both classical hygienic methods and advanced therapeutic technologies as well as an innovative approach to regulation of the microflora of the skin and eyelids. Among these methods there are both classical hygienic techniques and modern dermatological procedures. Additionally, advanced mechanical techniques are used, such as microblepharoexfoliation, vector thermal pulsation, and probing of the Meibomian glands. Vector thermal pulsation generates heat of 42.5°C. The device acts on the external side of the eyelids, at the same time protecting the cornea. Studies have shown that vector thermal pulsation may bring significant improvement in the function of the Meibomian glands and reduction of symptoms of dry eye syndrome even for a year after the procedure. Microblepharoexfoliation, through mechanical removal of deposits and mites from the eyelids, significantly improves the condition of the eyelid margins and may be used as a supplement to daily eye hygiene [14–16].

Cleansing with mandelic acid

Mandelic acid acts bacteriostatic, bactericidal, and exfoliating. In the therapy of rosacea, it plays a significant role in cleansing clogged sebaceous glands. Thanks to its exfoliating action, it prevents the formation of comedones and counteracts secondary bacterial infections, supporting the hydrolipid barrier of the skin. The keratolytic action of mandelic acid prevents the spread of Demodex. Therapy with the use of mandelic acid may be a supplement to treatment and it has not been found to interfere with pharmacological therapy [17].

Heat therapy

Regular warm baths, compresses, or use of a sauna may support elimination of Demodex. In this area, lamps emitting infrared radiation and specialized warming goggles have found application. Temperature above 54°C reduces the population of Demodex and makes further development of demodicosis impossible [1, 10].

PREVENTION

Change of lifestyle and an appropriate diet may support therapy. Increasingly, the role of restoring the balance of the microflora of the skin instead of striving for complete elimination of Demodex is emphasized. In the case of demodicosis, previously used cosmetics for makeup or skin care should be disposed of due to colonization by mites. The basis of eradication of Demodex is frequent washing of bedding and towels at high temperature. It is also recommended to resign from applying makeup, using greasy creams, or shared use of personal items. In the case of reduced immunity, it is recommended to take preparations based on propolis and/or echinacea extract, which may: stimulate regenerative processes, strengthen immunity, act anti-inflammatory and antibacterial [2, 6, 18].

CONCLUSION

Treatment of demodicosis can be demanding and may extend over several months. The most important issue is that the therapeutic process should simultaneously include treatment of the skin of the face and the eyelid margins. Such a combination determines the effectiveness of therapy and prevents recurrences of demodicosis [6]. The therapeutic process requires from the patient great perseverance and regularity in following recommendations. Unfortunately, the lack of clear standards of management makes that the therapy is based on the method of trial and error; the reaction to specific drugs may differ depending on the patient. As a result, treatment must be individually adjusted to the needs of the patient [18, 19].

CORRESPONDENCE
med. stud. Laura Sikorska
Faculty of Medicine, Collegium Medicum, Andrzej Frycz Modrzewski University
30-705 Kraków, ul. Gustawa Herlinga-Grudzińskiego 1
e-mail: laura666@onet.pl

ORCID
Laura Magdalena Sikorska – ID – https://orcid.org/0009-0000-5318-1368
Żaneta Elżbieta Kipias – ID – https://orcid.org/0009-0004-3768-3981
Wiktoria Błaszczyk – ID – https://orcid.org/0009-0000-6340-7957
Kacper Sukiennicki – ID – https://orcid.org/0009-0003-6864-4996

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