ORIGINAL ARTICLE

CONTENTS

Effective strategies for the treatment of eyelid diseases in modern ophthalmology

Rimma L. Skrypnyk, Nataliia A. Tykhonchuk, Inna D. Skrypnychenko, Alla I. Zadorozhna, Nataliia W. Zhaboedova, Oksana I. Parfonova
BOGOMOLETS NATIONAL MEDICAL UNIVERSITY, KYIV, UKRAINE

ABSTRACT

Aim: Investigate the effectiveness of micellar foam containing tea tree oil and Roman chamomile oil in preoperative eyelid sanitation in patients with blepharitis.

Materials and Methods: The study involved 37 patients with blepharitis, aged 28-62. Patients were split into two groups: 22 who used micellar foam preoperatively and 15 who did not. Diagnoses included chronic, seborrheic, and demodicosis blepharitis. Symptoms and signs were monitored over a ten-day treatment period, showing varied responses to micellar foam.

Results: The study showed a significant improvement in blepharitis symptoms with the use of foam containing tea tree and Roman chamomile oils. Patients reported reduced dryness, scaling, hyperemia, and itching. Microscopic examination showed disappearance of scales and couplings, and reduced hyperemia. Bacterial contamination decreased significantly, with good tolerance to the treatment.

Conclusions: Recent literature and our study indicate that women predominantly suffer from blepharitis, possibly due to their higher medical service utilization. Most cases were mild to moderate, with multifactorial causes and bacterial influence. Eight patients (36.4%) had non-bacterial blepharitis. Understanding blepharitis epidemiology helps in pathogenetically targeted treatment. The innovative micellar foam with tea tree oil and chamomile shows positive results and reduces antibiotic resistance risks.

KEY WORDS: blepharitis, antiseptics, presurgical eyelid treatment, compliance

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INTRODUCTION

Diseases of the eyelids account for about 10% of all eye diseases. The most common is blepharitis, a chronic condition characterized by inflammation of the eyelid margins, with recurrent symptoms of redness, lacrimation, and eye irritation. Patients with blepharitis comprise 25.3% of outpatient care, about 4 million annually in Ukraine [1-3]. The etiology is diverse, involving infections, immune disorders, dermatological diseases, trauma, and other factors.

Various factors can cause blepharitis:

- **Infectious factors:** Staphylococcus aureus is the most common bacterial cause; other bacteria, such as Streptococcus and Haemophilus influenzae, herpes simplex virus (HSV), Varicella zoster virus, and Candida albicans, can also cause blepharitis.
- **Immune factors:** Conditions like atopic dermatitis, contact dermatitis, mucosal pemphigoid, and Stevens-Johnson syndrome affect the eyelids.
- **Ophthalmic diseases:** Refractive errors, such as myopia, hyperopia, and astigmatism.
- **Chronic inflammatory foci:** In the tonsils, oral cavity, and paranasal sinuses.
- **Dermatological diseases:** Rosacea and psoriasis can affect the eyelids.
- **Traumatic factors:** Chemical or thermal burns of the eyelids.
- **Neoplastic processes:** Benign and malignant tumors, such as papillomas, actinic keratosis, sebaceous carcinoma, melanoma, squamous cell carcinoma, and basal cell carcinoma, can cause blepharitis [4-7].

Blepharitis can occur due to the activity of the Demodex folliculorum mite, found in 30% of patients with chronic anterior blepharitis. This mite is present in over 75% of adults over 70 and contributes to blepharitis, as shown by symptom improvement with therapy. Demodex prevalence increases with age and should be considered in differential diagnoses [8,9]. Demodex brevis affects the meibomian glands and is associated with posterior blepharitis, leading to tear film integrity issues, inflammation, and glandular dysfunction [10]. Blepharitis is often caused by multiple pathogenic factors [5,7].

Several types of blepharitis are distinguished by inflammation localization: anterior, posterior, and mixed. Anterior blepharitis is associated with staphylococcal infection and seborrhea, characterized by redness, dilated capillaries, and dry, brittle scales at the base of the eyelashes [2,4,5].

In turn, posterior blepharitis is mainly caused by rosacea, dysfunction or inflammation of the meibomian glands, which are responsible for the production of the lipid layer of the tear film (TF), which prevents the evaporation of tear fluid from the corneal surface. Clinically, meibomian gland dysfunction is characterized by stagnation of the meibomian gland lipid secretion, and obstruction of the gland excretory ducts is caused either by keratinization of the duct during a prolonged inflammatory process (chronic blepharoconjunctivitis) or by qualitative changes in the lipid composition of the secretion (metabolic disorders).

Today, there are several classifications of blepharitis, which reflect different types and etiological factors of this disease.

In 2002, Dr. Peter Foulks proposed a classification according to which all blepharitis can be divided into two main categories [11]:

1. Anterior blepharitis:
- Acne blepharitis: The most common type associated with sebaceous gland hyperactivity and bacterial overgrowth.
- Seborrheic blepharitis: Associated with seborrheic dermatitis, a chronic skin condition that affects the hair follicles.
- Atopic blepharitis: Associated with atopic dermatitis, a chronic inflammatory skin disease.
- Contact blepharitis: It is caused by allergens or irritants that come into contact with the eyelids.
- Infectious blepharitis: Caused by bacteria, viruses or fungi.
- Other: Rare causes such as psoriasis, rosacea, and chemical burns.

2. Posterior blepharitis:
- Meibomian gland dysfunction (MGD): The most common type associated with dysfunction of the meibomian glands, which produce lipids that are part of the TF.
- Demodicosis: Associated with microscopic Demodex mites that naturally live on our skin.
- Others: Rare causes such as autoimmune diseases and inflammatory conditions.

The next step was the International Workshop on MGD held in 2007, which proposed an updated classification of blepharitis that takes into account both clinical manifestations and etiology [12].

The classification includes:

I. Anterior blepharitis:

1) Anterior infectious blepharitis:
- Acute: characterized by sudden onset of redness, swelling, eyelids, itching, scaling and crusting;
- Chronic: characterized by a long course with periods of exacerbation and remission.

2) Anterior non-infectious blepharitis:
- Seborrheic: associated with excessive sebaceous gland production;
- Atopic: associated with atopic dermatitis;
- Rosaceous: associated with rosacea;
- Psoriatic: associated with psoriasis.

II. Posterior blepharitis:

1) Meibomian gland dysfunction:
- Mild: characterized by meibomian gland dysfunction without visible changes in the eyelids.
- Moderate: characterized by dysfunction of the meibomian glands with the formation of scales and crusts on the eyelids.
- Severe: characterized by dysfunction of the meibomian glands with thickening of the eyelid margins, eyelid reverse side and corneal ulcers.

III. Mixed blepharitis: a combination of anterior and posterior blepharitis.

Blepharitis is a complex, multifactorial disease affecting not only the eyelid margins but also structures like the meibomian glands, bulbar and tarsal conjunctiva, and cornea. This impacts homeostasis and functioning, leading to a chain reaction of complications. Changes in meibomian gland secretion destabilize the TF, causing evaporation and tearing, inflammation, and irritation. Dysfunction of the meibomian glands also alters the TF microflora, promoting pathogenic microorganisms [13].

Studies show that posterior blepharitis has a distinct eyelid and conjunctival microflora, with more bacteria like coagulase-negative staphylococci, Corynebacterium species, and Cutibacterium acnes [14,15]. These bacteria produce lipase, breaking down TF lipids and altering its composition [16]. Blepharitis causes discomfort and can affect surgical outcomes by being a source of pathogenic microflora. Anterior blepharitis often involves staphylococcal and streptococcal infections, causing postoperative complications, while atypical mycobacteria can cause issues post-LASIK surgery [17-19].

Instability of the TF can disrupt reparative processes after corneal access cataract surgery or keratorefractive surgery, and worsen secondary dry eye syndrome after LASIK. A stable TF is crucial for reliable keratometry data before cataract surgery and accurate corneal topography before refractive surgery [20-23].

Preoperative eyelid sanitation is essential to reduce postoperative infectious complications, enhance TF stability, and improve visual function recovery. Antiseptics

play a vital role in modern ophthalmology, used to treat and prevent infectious diseases of the eyelids and conjunctiva, prevent postoperative infections, and manage injuries. The choice of an antibacterial drug depends on the disease, its severity, and the pathogen's sensitivity. The issue of antibiotic resistance highlights the need for newer broad-spectrum antimicrobial agents [24,25].

The new formula for preventing and treating eyelid diseases is an innovative micellar foam. It contains tea tree oil (Melaleuca Alternifolia) 0.02%, Roman chamomile essential oil (Anthemis Nobilis), D-panthenol, allantoin, and taurine. Tea tree oil has powerful antiseptic, acaricidal, anti-inflammatory, and analgesic properties, effective against S. aureus, Pseudomonas aeruginosa, Escherichia coli, and Candida albicans [25-27]. Roman chamomile essential oil has anti-inflammatory, antiseptic, analgesic, and soothing properties. D-panthenol stimulates regeneration and strengthens collagen fibers. Allantoin and taurine provide anti-inflammatory, protective, moisturizing, and keratolytic effects.

The foam's unique composition allows for quick penetration at low concentrations. It offers prolonged release of pharmacological components, reducing the need for frequent application. The foam is comfortable to use, evenly distributed, and reduces irritation for sensitive eyes. It also eliminates microbial contamination, making it ideal for patients with chronic eye diseases and those leading active lifestyles [28-31].

AIM

To investigate the effectiveness of micellar foam containing tea tree oil and Roman chamomile oil in preoperative eyelid sanitation in patients with blepharitis.

MATERIALS AND METHODS

The study examined 37 (74 eyes) patients aged 28 to 62 years. The inclusion criteria were a diagnosis of blepharitis confirmed by ophthalmologic examination and planned eye surgery. Exclusion criteria were ophthalmic diseases other than blepharitis, the presence of systemic diseases that have a negative impact on the eyes, and allergy to the components of micellar foam.

Patients were divided into two groups. The first group included 22 patients, 10 men and 12 women, with blepharitis, who received preoperative eyelid sanitation with micellar foam for 10 days before surgery. The second group included 15 patients, 7 men and 8 women, with blepharitis who did not receive preoperative eyelid sanitation.

Among them, 15 patients (40.5%) were patients with chronic blepharitis with uncorrected ametropia; 9 patients (24.3%) had seborrheic blepharitis; 13 patients (35.1%) had demodicosis blepharitis confirmed by microscopic examination of eyelashes. The average duration of blepharitis in group 1 was 1.5 ± 1.2 years, and in group 2 – 1.3 ± 1.1 years ($p>0.05$).

Before treatment, all patients underwent an ophthalmologic examination, swabbing of the eyelid conjunctiva for bacteriologic examination, ametropia correction and gastroenterologist consultation, if indicated.

According to the study, the patients were diagnosed with mild (21 patients, 56.8%) to moderate (16 patients, 43.2%) blepharitis. The predominant symptoms of blepharitis were itching, burning, foreign body sensation, edema, eyelid margin hyperemia, plaque formation, scales and/or meibomian gland enlargement at the time of examination.

All patients in group 1, while observing all the necessary hygiene rules during the treatment of blepharitis, applied micellar foam to the eyelids twice a day. The patients were explained the method of application: the foam was to be sprayed onto clean fingers, then, with the eyes closed, the eyelashes and eyelid margin were rubbed with foam for 60-90 seconds. After each application, the eyes and eyelids were rinsed thoroughly with clean water. The total treatment period was a ten-day course. The signs and symptoms of blepharitis were assessed at each visit before treatment, on the 3rd, 7th and 10th day of treatment based on the results of changes in clinical signs of the disease.

The research was conducted in compliance with the basic norms of bioethics and the requirements of the Helsinki Declaration on Human Rights and Biomedicine (1977) and the relevant laws of Ukraine.

RESULTS

The analysis of the results of clinical observation of patients with blepharitis showed that at the end of the therapy, a pronounced positive dynamics was noted against the background of active therapy with foam containing tea tree oil and Roman chamomile oil. Patients reported significant relief of the condition, reduction of discomfort and the feeling of a foreign body in the eyes. The therapeutic effect was manifested not only by a reduction in the main subjective symptoms, such as dryness, peeling, eyelid flushing and itching, but also by a marked improvement in the objective picture, which was confirmed by microscopy. There was a complete or partial disappearance of scales and couplings at the root of the eyelashes, a decrease or complete elimination of hyperaemia of the marginal eyelid margin. In addition, patients significantly improved the condition of the eyelid skin, reduced the severity of the inflammatory process, and normalised

Table 1. Results of changes in clinical signs in patients before and after treatment

Clinical signs	Before treatment	Day 3 of treatment	Day 7 of treatment	Day 10 of treatment
Redness	Explicit	Redness reduction	Minimal or absent	No redness
Edema	Explicit	Edema regression	Limited or absent	No edema
Scaling	Explicit	Minimal scaling	Minimal or absent	No scaling
Itching	Severe or moderate	Itching relief	Minor or absent	Excluded
Burning	Intense	Minimal burning	Minimal or absent	No burning
Sticking of eyelids	Present	Minimal sticking	Absent	Absent

the structure of the ciliary margin, which contributed to long-term remission of the disease. The results of the changes are presented in Table 1.

The assessment of clinical manifestations of blepharitis was carried out on the basis of a special scale that allowed a comprehensive analysis of both the subjective feelings of patients and objective biomicroscopic signs of the pathological process. For this purpose, a 3-point rating system was used, which reflected the severity of symptoms. In particular, the scale included an assessment of the level of subjective discomfort experienced by patients, as well as the identification of changes recorded during biomicroscopic examination of the eyes. Each of the parameters was assessed using a three-point scale, where:

+ + + significantly pronounced symptoms,
+ + moderately pronounced symptoms,
+ slightly pronounced symptoms,
– complete absence of symptoms.

By the end of the study, all patients in the first group noted a significant improvement in their health and a reduction in the severity of blepharitis symptoms. In particular, they reported a decrease in light sensitivity, pain, and discomfort during visual activities such as reading, driving in the dark, and working with electronic devices with screens.

The results of bacteriological analysis showed that at the beginning of the study, 14 patients (63.6%) in the first group had bacterial contamination of the conjunctiva, with Staphylococcus aureus being the main causative agent of blepharitis. However, after the treatment, the level of bacterial contamination decreased significantly, with only two patients (9%) still having conjunctival contamination.

The treatment was generally well tolerated by the patients. The only exception was one case: one patient developed contact dermatitis, which required additional medication changes.

DISCUSSION

Diseases of the eyelids account for approximately 10% of all eye diseases, with blepharitis being a prevalent chronic condition characterized by inflammation of the eyelid margins [1-3]. The multifactorial etiology of blepharitis includes infections, immune disorders, dermatological diseases, trauma, and neoplastic processes [4-7]. Our study revealed a significant improvement in symptoms with the use of micellar foam containing tea tree and Roman chamomile oils. These findings align with previous research, which also highlighted the role of bacterial and Demodex mite involvement in blepharitis pathogenesis [8-9].

Patients with blepharitis are common in outpatient care, comprising about 25.3% of such visits in Ukraine. The prevalence of Demodex mites increases with age and is a notable factor in both anterior and posterior blepharitis. The study showed the efficacy of micellar foam in reducing symptoms, improving the objective microscopic picture, and decreasing bacterial contamination [10-14].

Despite these positive outcomes, our study had potential methodological limitations, including a small sample size and short follow-up period. Future research should focus on larger patient groups and long-term effects to confirm these findings. The observed reduction in antibiotic resistance and patient discomfort suggests that micellar foam is a viable alternative treatment for blepharitis [15-19].

Our results show on blepharitis treatment, emphasizing the importance of innovative therapies in managing this complex, multifactorial disease. Further studies should explore the combined effects of different treatment modalities to enhance patient outcomes [20-25].

The presence of blepharitis can lead to physical, cosmetic, and social discomfort, affecting the quality of life of patients and the outcomes of ophthalmic surgeries. Preoperative eyelid sanitation is crucial for reducing postoperative infectious complications and ensuring the stability of the tear film. The innovative micellar foam, with its unique composition and prolonged effect, shows promise in managing blepharitis and mitigating antibiotic resistance risks, enhancing patient comfort and treatment compliance [26-31].

CONCLUSIONS

Literature sources of recent years have shown that women predominate among patients with blepharitis. The same trend was observed in our study. This may be due to the fact that women seek medical services more often than men.

According to the classification adopted in this study according to the severity of blepharitis, most of them were mild to moderate, which indicates that the disease does not often manifest itself so aggressively.

In general, the cause of blepharitis is not always possible to establish, given its multifactorial nature, and with a probable bacterial influence. In its pathogenesis, bacterial lipase alters the secretion of the meibomian gland, promoting the growth and reproduction of bacteria.

It should be borne in mind that patients may often have several etiologic factors. However, not all cases are associated with infection. In the study population, our study showed that 8 (36.4%) patients did not have blepharitis associated with bacterial colonization.

Understanding the epidemiologic characteristics of blepharitis allows for pathogenetically targeted treatment. The importance of preoperative eyelid sanitization to minimize the risk of postoperative infectious complications remains significant. The rise in antibiotic resistance among microorganisms, including in ophthalmology, has become a growing concern in recent years. Therefore, the early administration of potent, broad-spectrum antimicrobials is necessary.

An innovative micellar foam containing tea tree oil, Roman chamomile essential oil, D-panthenol, allantoin, and taurine is suitable for the prevention and treatment of eyelid diseases. This formulation achieves notable positive outcomes, reducing patients' subjective complaints and improving the objective clinical picture of the disease. The micellar foam form offers additional benefits, allowing twice-daily use with maximum eyelid coverage and comfortable tolerability.

The combined antiseptic, disinfectant, and anti-inflammatory effects of the drug make it highly recommended for clinical practice. These effects help mitigate and avoid the risks associated with antibiotic treatment, such as the development of bacterial resistance or hypersensitivity reactions, and increase patient compliance.

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CONFLICT OF INTEREST

The Authors declare no conflict of interest

CORRESPONDING AUTHOR

Rimma Skrypnyk

Bogomolets National Medical University
13 Shevchenko Boulevard, 01601 Kyiv, Ukraine
e-mail: rimmaskrypnyk@gmail.com

ORCID AND CONTRIBUTIONSHIP
Rimma L. Skrypnyk 0000-0002-8463-1701 A
Nataliia A. Tykhonchuk 0009-0008-5712-4780 B
Inna D. Skrypnychenko 0009-0001-3749-7474 D
Nataliia W. Zhaboedova 0009-0006-5275-5837 E
Alla I. Zadorozhna 0009-0008-9537-8749 C
Oksana I. Parfonova 0000-0003-0603-5135 F

A – Work concept and design, B – Data collection and analysis, C – Responsibility for statistical analysis, D – Writing the article, E – Critical review, F – Final approval of the article

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