E.G. Polunina

Eyelid hygiene with the dry eye syndrome and blepharitis of various origins

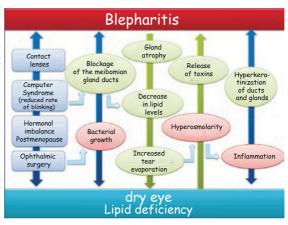
«We are in great debt of our patients: we have never explained to them properly how important it is to take care of the eyelids ...» Professor G.S. Polunin



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I. Blepharitis and the "dry eye"

Until recently, inflammatory diseases of the eyelids, i.e. blepharitis, were considered to be a separate group of diseases which cause discomfort in patients, but most of them do not lead to visual impairment. Therefore, insufficient attention was paid to blepharitis treatment, despite the fact that more than a quarter of patients who seek help from ophthalmologists suffer from this pathology. However, in the last decade, a lot more attention has been paid to this problem due to the fact, that in the development of corneal-conjunctival xerosis or the dry eye syn-



drome (DES), the role of lipid secretion disorders by the meibomian glands located in the thickness of the eyelids has been revealed. Furthermore, as it turned out, postoperative complications can develop in the presence of blepharitis and DES.

Currently, there is a clear trend towards an increase in the occurrence of various forms of DES among the population around the world. The value of this parameter has doubled over the past decades, and the occurrence of DES in the population correlates with an increase of the patient's age. The problem of diagnosing DES is very relevant due to the lack of awareness of physician regarding the variety of clinical forms of DES, especially at the outpatient level. Despite the fact, that until the present time, there is no consensus on the DES classification. Most authors believe that more than 90% of the patients with this pathology suffer from the meibomian gland dysfunction (MGD), meaning a lipid deficiency DES.

It is known that the secretion of lipids is carried out by the meibomian glands. Meibomian glands are large sebaceous glands located in the cartilage of the eyelids. MGD leads to a decrease in the lipid content in the lacrimal fluid, and consequently, to an increased evaporation of the water fraction of the tear, since it is the lipid layer of the tear film, located most superficially, preforming very important functions as follows:

- · slows down the evaporation of the tear film;
- provides a "sealing" bridge between the edges of the eyelids during sleep;
- · creates a smooth optical surface;
- prevents contamination of the tear film, providing a barrier for the secretion of the sebaceous glands of the skin;
- reduces the tension on the surface of the tear film.

Dysfunction or thinning of the lipid layer leads to an increase in the evaporation of the tear film, and as a result, to an appearance of complaints that are specific to the «dry eye», even in cases of a normal level of tear production, as well as an increase in the osmolarity of the tear fluid, which provokes the development of blepharitis – inflammatory processes of the eyelids of various etiologies.

In accordance with the classification of David BenEzra and Gilbard JP, blepharitis is divided into two groups, anterior and posterior.

Classification of blepharitis:

Anterior blepharitis

non-infectious (seborrheic, toxic, allergic); infectious (bacterial, viral, parasitic); mixed.

Posterior blepharitis

blepharitis caused by the meibomian gland dysfunction; meibomites.

The variety of clinical forms and etiological factors of blepharitis, reflected in the classification, indicates the necessity for a differentiated approach to their diagnosis and treatment, and the inextricable relationship of blepharitis with the lipid deficiency DES indicates the need for complex therapy, which includes methods allowing to restore the lipid layer of the tear film and replenish the level of tear fluid.

II. Eyelid hygiene

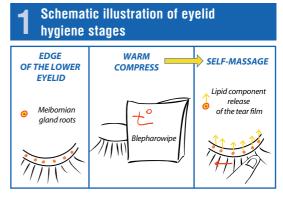
The treatment base for blepharitis and lipid deficiency DES is the eyelid hygiene!

Eyelid hygiene or therapeutic eyelid hygiene is a scientific and practical field that has developed in our country since the appearance of Blepharon 1 and Blepharon 2 more than 10 years ago (G.S. Polunin, Research Institute of Eye Diseases, Russian Academy of Medical Sciences (RAMS), N.A. Vengerova, Geltek-Medica). Many years of experience in observation of patients and scientific research in this field have allowed the development of a whole series of hygienic effective products — Blepharon 1, Blepharon 2, Blepharolotion, Blepharowipe and Blepharon Cleansing, which are designed for every-day eyelid hygiene. Eyelid hygiene is intended for restoration and maintenance of the eyelid health, increasing the elasticity and eliminating wrinkles of the eyelid skin. Eyelid protection, especially the marginal edge, from the damaging effects of aggressive environmental agents, infections and parasites is the basis for prevention and treatment of blepharitis and eye dryness, since competent eyelid hygiene contributes to the normal functioning of the glands, restores metabolic processes in the skin and provides formation of a full-fledged tear film.

It should be explained to the patient that blepharitis is a chronic condition and that eyelid hygiene should become a part of the daily life. The main factor influencing the effectiveness of eyelid hygiene is the thoroughness and regularity of hygiene procedures. Many years of experience in observing patients with this pathology have shown, that those patients who schematically depicted the anatomical structure of the eyelid and explained the general principles of the action of warm compresses, during the conversation, their effect on the secretion of fatty glands located in the thickness of the eyelids, and the effect of subsequent self-massage of the eyelids on the restoration of the protective properties of the tear film, the treatment was carried out more consciously and the degree of satisfaction

with the treatment was higher, which significantly influenced the final results of the therapy.

- 2 main highlighted stages of the eyelid hygiene procedure (Fig. 1):
- 1. Warm compresses for eyelids with a Blepharowipe / Blepharolotion to liquefy the sebaceous secretion and open the roots of the meibomian glands ducts.
- 2. Circular self-massage of the eyelids with Blepharons for drainage of meibomian glands and skin moisturization of the eyelids.



The composition of Blepharolotion (Blepharowipes) includes: chamomile extract, which has a cleansing, antiseptic and anti-inflammatory effect, witch hazel extract as a cleansing and anti-inflammatory agent and green tea extract, which increases the skin tone and normalizes the cell activity.

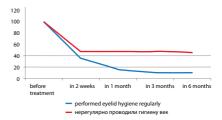
The basis of Blepharon 1 and Blepharon 2 consists of the hyaluronic acid, which has high sorbing, cleansing and moisturizing properties and, therefore, regulates the moisture content in the skin of the eyelids, cleanses and moisturizes the skin, increases the eyelid elasticity. Hyaluronic acid, a natural compound, is widely present in human and animal organs and tissues, which performs a variety of functions, including regulation of moisture levels in tissues and processes of migration and differentiation of cells. Hydrated hyaluronic acid takes up most of the volume of the eye (about 90%). The main metabolism in the cornea and vitreous body of the eye is carried out through hyaluronic acid, hence there is no more "eye substance" beside the hyaluronic acid. The composition of Blepharon 2 includes sulfur products with antiseptic, acaricidal, cleansing and dermotoprotective properties. Both Blepharons contain Aloe Vera extract, which has anti-inflammatory, antiseptic and toning properties.

Warm compresses with a Blepharowipe, soaked in Blepharolotion, improve metabolic processes in the tissues of the eyelids, which is very important for the drainage of the excretory ducts of the meibomian glands. They accumulate lipid secretion, individual fractions which become thick at temperatures from 34.4 °C to 35.7 °C, especially in dry air, which leads to formation of duct plugs, the development of stagnant secretion, and in turn, disrupts evacuation secretion from the glands and impairs blood circulation. Thus, favorable conditions are created for the development of infections and vital activity of ticks. Therefore, the progress of blepharitis and dry eyes are aggravated, respectively.

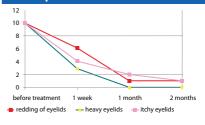
To improve blood circulation in the eyelids and conjunctiva, as well as to drain the glands located in them, it is recommended to massage the eyelid edges with Blepharon. The massage can be performed either by a physician applying a glass rod under local anesthesia, or independently by the patient using selfmassage. It should be noted, that self-massage procedure is much less traumatic and less unpleasant for the patient, which may be performed daily at home. Furthermore, the eyelid massage with a glass rod is contraindicated due to its high trauma in patients with certain skin diseases, in particular, psoriasis. Therefore, based on our clinical practice, we often recommend self-massage of the eyelids in combination with warm compresses.

Thus, eyelid hygiene is aimed at restoring the meibomian gland functions, softening the lipid secretion under the influence of temperature — warm compresses with a Blepharowipe (beginning of Chapter 2), which facilitates its evacuation at the next stage, self-massage of the eyelids with Blepharon. Self-massage has a complex effect — it upregulated the emptying of the meibomian glands, therefore, it restores the lipid component of the tear film, cleanses the skin of the eyelids, improves blood circulation, which reduces

Dynamics of complaints in groups of patients who did / did not practice eyelid hygiene with Blepharons in %



3 Dynamics of subjective perceptions during treatment of blepharitis with Blepharons in points



the inflammatory level and allergic reactions and, if using Blepharon 2, has an anti-demodectic effect (Fig. 2 and 3). It should be noted, that eyelid hygiene is technically simple to perform and takes little time. However, as a rule, it allows patients to feel symptomatic relief due to the restoration of the lipid layer of the tear film immediately after these actions.

Evelid hygiene procedure

- **1. Warm compresses.** A Blepharowipe, sealed and soaked in Blepharolotion, is heated in a glass with hot water. A cotton pad may be used, preliminarily moistened in warm water, wrung out and also soaked in Blepharolotion. A wipe or disk is applied onto closed eyelids for 1-2 minutes, after which a self-massage of the eyelids is performed using Blepharon 1 or Blepharon 2.
- 2. Self-massage of eyelids. The patient applies Blepharon 1 or Blepharon 2 to the fingertips or to the tip of a cotton swab and in gentle circular movements, parallel to the edges and towards

the gland roots, massage the eyelids including the ciliary edge for 1-2 minutes. The procedure is carried out daily for 1-2 minutes twice a day, in the morning and in the evening, the duration of the course is 1-2 months. With the resumption of symptoms, a second course is carried out with an interval of 1 month.

Eyelid hygiene is well supplemented by an increased rate of blinking recommended to the patient, especially under conditions of increased visual stress. An increase in the rate of blinking contributes to the emptying of the meibomian glands, therefore, the restoration of the protective lipid layer of the tear film, the cleansing of the conjunctival cavity, the outflow of fluid, the maintenance of the temperature of the ocular surface, a decrease in which leads to a dysfunction of the functional state of the lipid layer of the tear film, and uniform distribution of the tear film over the ocular surface. In case of infectious blepharitis and conjunctivitis, if indicated, the eyelids and conjunctival cavity are washed and sanitized. Washing is performed in order to remove mucous and foamy secretions containing bacteria, mites, toxic and allergenic metabolic products. Various solutions of antibacterial products for washing are used, recommended by a physician. Anti-inflammatory product are prescribed in some cases. The washing procedure is best done after hygienic treatment of the eyelids in the evening time. Instillation of antibiotic solutions is carried out 2-3 times during day time. The

Therefore, the treatment of blepharitis and the associated lipid deficiency DES is carried out in a comprehensive manner, based on the etiological factor. Medicinal products of different pharmacological groups are prescribed, based on the background of eyelid hygiene, including tear replacement therapy.

III. Clinical forms of blepharitis, treatment regimens including eyelid hygiene

Meibomian gland dysfunction

Dysfunction of the meibomian glands can occur both in isolation – posterior blepharitis (MGD, meibomyitis) and accompany any pathological processes of the eyelids. It should be noted that MGD is the most common cause of lipid deficiency DES. MGD is primarily caused by the blockage of terminal ducts by a thickened opaque secretion containing keratinized cellular material. In turn, blockage is caused by excessive keratinization of the epithelium of the ducts and increased viscosity of the secretion. The block-

duration of the rehabilitation course is usually 7-10 days.



age process is influenced by endogenous factors, i.e. age, gender and hormonal disorders, as well as exogenous factors, such as the use of topical medicinal products. Blockage can lead to

cystic enlargement of the glands, atrophy of mebocytes, prolapse of the gland and a decrease in the intensity of secretion (Fig. 4). As a result, the MGD reduces the secretion availability of the meibomian glands at the border of the eyelid to the tear film. Lipid deficiency can result in accelerated evaporation, hyperosmolarity and instability of the tear film, accelerated bacterial growth at the border of the eyelid, evaporative dryness of the eyes, as well as inflammation and damage to the surface tissues of the eye.

Diagnostics

Complaints: discomfort, often described as a burning sensation or gritty eyes, pain when blinking and eye fatigue. These symptoms are often noticeable upon awakening, redness of the eyes, sometimes a feeling of eyelids sticking together may be present.

Biomicroscopy: Meibomitis is characterized by inflammation and blockage of the meibomian gland ducts. The posterior edge of the eyelids is hyperemic and diffusely inflamed, telangiectasias on the posterior surface of the eyelid. When squeezed, the secretion of the glands is dense and viscous, or, in most severe cases, it does not excrete. With long-term meibomitis, the gland ducts become impassable and the posterior edge of the eyelid thickens.

However, in some cases, the MGD can be visualized after a compression test by nature of the secreted secretion only.

Tests for tear production and dysfunction of the meibomian glands. The greatest diagnostic value in MGD is the Tear Film Break-Up Time (TFBUT) and the compression test, since they reflect the state of the lipid layer of the tear film and the quantity / quality of lipids entering the tear. Then, the patient should be assessed for signs of damage to the surface of the eye and signs of dry keratoconjunctivitis (Schirmer's test, coloring with vital colorants).

Treatment

Treatment of the meibomian gland dysfunction is aimed at restoring their functional state through hygiene of the eyelids, compensation of the lipid layer of the tear film using tear substitutes with the elimination of the etiological cause of the disease (inflammatory or toxic-allergic factor) and prevention of complications (lipid deficiency DES, chronic blepharoconjunctivitis and keratoconjunctivitis, deformation of the eyelid edges, styes, chalazion, trichiasis, etc.).

Eyelid hygiene is performed to empty the meibomian glands, therefore, restoring the lipid component of the tear film, cleansing the skin of the eyelids, improving blood circulation, which reduces the inflammatory level and allergic reactions. Hygiene procedures include the following:

- warm compresses with a Blepharowipe / Blepharolotion;
- self-massage of the eyelids with Blepharon 2 in accordance with the diagram.

Drug therapy

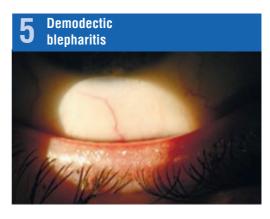
In the majority of patients, Meibomian Gland Dysfunction (MGD) is mild to moderate, therefore, the prescription of eyelid hygiene and tear replacement therapy is sufficient to stop the pathological process. However, in some cases, it is necessary to expand the drug therapy.



- **antibiotic therapy** (tetracycline ointment, Tobrex drops, etc.) is carried out if there are signs of a bacterial infection the presence of mucopurulent discharge, etc. The course is 7-10 days.
- **antiseptics** (Vitabact, Okomistin, etc.) preventative treatment of a secondary infection in the presence of mucous discharge from the eyes. The course is 7-10 days.
- **antihistamines** (Opatanol, Lecrolyn, etc.) are prescribed if there are signs of an allergic reaction. The course is 7-10 days.
- **tear substitutes** (Systane Balance, Hylo COMOD, etc.) are prescribed to restore the tear film stability in the presence of patient complaints of discomfort and eye fatigue. The course is 1-2 months. **Recommended:** Increased rate of blinking, especially with increased visual stress.

2. Demodex blepharitis

Mites of the Demodex genus are conditionally pathogenic microorganisms, found in 90% of adults (in 72.5% of cases, Demodex eyelids are combined with lesions of the skin of the face). However, not every patient is prone to this disease. Mites with size of 0.2-0.5 mm, live in the ducts of the sebaceous and meibomian glands, in the roots of the hair follicles of humans and mammals. As a rule, the majority of the population has an asymptomatic carriage of mites of the Demodex genus. However, in case of reduced immunity, as well as



under the influence of various negative external factors, such as exposure to high temperatures, solar irradiation, unfavorable living and professional conditions, operations on the eyeball and internal factors – diseases of the nervous, vascular and endocrine (for example, diabetes mellitus) systems, gastrointestinal tract and liver, metabolic disorders, the demodicosis occurs. A chronical state of the demodicosis of the eyelids can cause conjunctivitis, keratoconjunctivitis and, as a result, MGD accompanying blepharitis, lipid deficiency DES (Fig. 5).

Diagnostics

Complaints: as a rule, patients complain of a burning sensation, itching in the eyelids, aggravated by heat, reddening of the eyelids, a feeling of "heaviness" of the eyelids, a feeling of discomfort and "dryness" of the eyes.

Biomicroscopy: the eyelid edges are thickened, hyperemic. A characteristic sign of blepharitis of demodectic etiology is the presence of "white muffs" or "collars" at the base of the eyelashes which are stuck together. Furthermore, pronounced inflammation develops of the ciliary eyelid edges, which become thickened and redness occurs. With prolonged chronic disease, the edges of the eyelids become deformed, there is a flattening of the anterior and posterior ribs of the free edge of the eyelids, which can result in trichiasis.

Laboratory research on Demodex presence on eyelashes. The material for the study of mites is epilated eyelashes, in a quantity of 3-4 from each eyelid, which are placed on a glass slide in a drop of glycerin, covered with a cover glass and placed on a microscope. The diagnosis of demodicosis is established on the basis of detection of any phases of mite development during microscopic examination of epilated eyelashes.

Tests for tear production and dysfunction of the meibomian glands. In order to diagnose DES and to resolve the issue of the advisability of prescribing tear replacement therapy, the Schirmer test is performed, a decrease in which indicates a violation of the secretion of the aqueous phase of the tear film, as well as a compression test and a Tear Film Break-Up Time (TFBUT) test. Changes in the indicators of these tests are a consequence of the MGD and a prescription for tear replacement therapy.

Treatment

Non-drug therapy

Eyelid hygiene is carried out in order to cleanse the surface of the eyelids, to stop the inflammatory process and toxic-allergic reactions resulting from the vital activity of the mite. Hygiene procedures include the following:

- warm compresses with a Blepharowipe / Blepharolotion;
- self-massage of the eyelids with Blepharon 2 in accordance with the diagram.

Physiotherapy is carried out in order to improve the outflow of secretion from the meibomian glands in the form of phonophoresis with Blepharon 2.

Drug therapy

The drug therapy algorithm depends on the clinical manifestations, the prevalence level of the pathological process. The following groups of products are prescribed on the basis of the indications:

- **antimicrobial** (Metronidazole) are used systemically and topically. The course of treatment is 4-6 weeks:
- **antibiotics** (tetracycline ointment, Tobrex, Cipromed, etc.) are prescribed if there are signs of bacterial infection. The course is 7-10 days;
- **antiseptics** (Vitabact, Okomistin, etc.) as preventative treatment of the secondary infection. The course is 7-10 days;
- non-steroidal anti-inflammatory products (Diclo-F, Indocollyre, etc.) in the presence of signs of chronic blepharoconjunctivitis of non-bacterial etiology. The course is 7-10 days;
- antihistamines (Opatanol, Lecrolyn, etc.) are prescribed if there are signs of an allergic and toxicallergic reaction. The course is 7-10 days;
- tear substitutes (Hylo-Comod, Hylomax-Comod, Systane Ultra, etc.). The reason for their prescription are complaints regarding the "dry" sensation and discomfort in the eyes, MGD in accordance with the compression test, a decrease in the Schirmer test and TFBUT. The course is 1-2 months.

It is recommended to consult a gastroenterologist, dermatologist, nutritionist (exclude spicy, salty and sour food products). Limit baths and saunas. Taking into account the chronic nature of the disease, it is recommended to carry out repeated courses of eyelid hygiene with prescription of tear substitutes.

Steroid products are not used in the treatment of demodectic blepharitis, as they reduce local immunity and increase the number of mites.

During the examination of patients with demodectic blepharitis, it is very important to assess the condition of the skin of the face for the prevalence of the demodectic process, as well as to identify signs of rosacea, a chronic recurrent skin disease of the face, which occurs mainly in women after the menopause. The pathogenesis is based on angiotrophoneurotic disorders, in the innervation zone of the trigeminal nerve, the tone of the superficial vessels of the skin, primarily the venous bed, changes. It is recommended to use Demoten (Geltek-Medica, Russia) for the treatment of inflammatory processes in the facial area, which contains a higher concentration of sulfur preparations in comparison with Blepharon 2.

1. Seborrheic blepharitis

Seborrhea (from Latin "Sebum" (lard) and Greek "rrhea" (flow)) is a skin disease caused by a disorder of the neuroendocrine regulation of the functions of the sebaceous glands of the skin.

There are 3 types of seborrhea: oily, dry and mixed. Seborrheic blepharitis is usually associated with seborrheic dermatitis (seborrhea of the scalp, nasolabial folds, area behind the ear and sternum). It is believed that the excess amount of neutral lipids formed in this condition is degraded by Corynebacterium acnes to fatty acids, which are irritat-



ing and provoke the development of the inflammatory process. As a rule, the chronic inflammatory process of the sebaceous glands of the eyelids is accompanied by the meibomian glands dysfunction, which contributes to the development of corneal-conjunctival xerosis and an increase in the virulence of pathogenic microorganisms of bacterial and parasitic origin.

Diagnostics

Complaints: "heaviness", feeling of "tightness" in the eyelids, "dry eyes", peeling of the eyelid edges – these symptoms occur in a dry form of seborrhea. Oily seborrhea, a hypersecretory form, is accompanied by complaints of a "sticking" sensation of the eyelashes, frothy discharge from the eyes, feeling of fatigue and "dryness" of the eyes (Fig. 6 and 7).

Biomicroscopy: with a hypersecretory form of seborrhea, the eyelids seem greasy and the eyelashes stick together. With seborrheic blepharitis, the scales are soft and oily and are located on the marginal edge of the eyelids, the eyelashes are stuck together and have an "oily" appearance. Soft scales are easily removed; no ulceration remains after their removal. Meibomian seborrhea is characterized by excessive secretion of the meibomian glands without signs of inflammation. The main signs are

small cysts ("oil balls") on the costal edge of the eyelid, containing the secretion of the meibomian glands, as well as an excessively oily and frothy tear that accumulates on the edges of the eyelids and in the inner corners of the eyes.

Tests for tear production and the meibomian gland dysfunction: important diagnostic information is provided by a compression test, results of which indicate the possibility to determine the involvement level of the meibomian glands in the pathological process and the nature of the secretion of these glands – hypo- or hypersecretion, which, in turn, allows to determine the most effective tactics of treatment.



Treatment

Treatment of seborrhea should be carried out in a complex manner using drug or non-drug methods and depends on whether dry or oily seborrhea is treated.

Non-drug therapy

Eyelid hygiene is carried out in order to restore the functional state of the sebaceous glands, cleanse the surface of the eyelids from crusts and scales that have arisen as a result of the disease, as well as moisturize the eyelids, which is especially important in the dry (hyposecretory) form of seborrhea. Hygiene procedures include the following:

- warm compresses with a Blepharowipe / Blepharolotion;
- self-massage of the eyelids with Blepharon 2 in accordance with the diagram.

Eyelid massage is performed to drain the meibomian gland ducts in an outpatient setting. Eyelid massage is prescribed for the oily (hypersecretory) form of seborrhea, accompanied by hypersecretion of the Zeis, Moll's and meibomian glands. The course consists of 10 procedures.

Physiotherapy is carried out in order to improve the secretion outflow from the meibomian glands in a form of phonophoresis with Blepharon 1.

Drug therapy

The drug treatment, carried out in the treatment of seborrheic blepharitis, depends on the severity and prevalence of the pathological process and may include the following types of products:

- antibiotic therapy (tetracycline ointment*, Tobrex drops, Cipromed, etc.) is carried out in the presence of signs of the bacterial infection a course of 7-10 days;
- antiseptics (Vitabact, Okomistin, etc.) for preventative treatment of the secondary infection a course of 7-10 days;

- non-steroidal anti-inflammatory products (Diclo-F, Indocollyre, etc.) in the presence of signs
 of chronic blepharoconjunctivitis of non-bacterial etiology. A course of 7-10 days; antihistamines
 (Opatanol, Lecrolyn, etc.) are prescribed if there are signs of an allergic reaction. The course is
 7-10 days;
- **steroids** (hydrocortisone eye ointment, Prenacid, etc.) are used in cases of persistent blepharitis with pronounced signs of allergy. The course is 7-10 days, the product is applied to the skin of the eyelids 2-3 times per day. If necessary, it is placed under the lower eyelid once per day at night time.
- tear substitutes (Hylo-Comod, Hylomax-Comod, Systane Ultra, Oftagel, Oftalik, etc.) are prescribed after patient's complaints are recieved regarding dryness and discomfort in the eyes, MGD (in accordance with the compression test), a decrease in the Schirmer test and TFBUT. The course is 1-2 months;
- reparative therapy (VitA-pos, Corneregel, Hylozar-Comod) is prescribed when the cornea is involved in the xerotic process punctate epitheliopathy and conjunctival lesions coloring with vital colorants.

Recommended: consultation with an endocrinologist, nutritionist, dermatologist. Considering the chronic nature of the course of the disease, repeated courses of eyelid hygiene with the appointment of symptomatic therapy in the form of instillation of tear substitutes.

* The widespread use of tetracycline eye ointment in the treatment of blepharitis is explained by its high efficiency and it is believed that tetracycline not only helps to reduce the production of lipase by staphylococci (staphylococcal blepharitis), but also causes disintegration of free fatty acids, which leads to relief of inflammation signs.

2. Staphylococcal blepharitis

In accordance with the data obtained by local and foreign authors, the composition of the bacterial microflora of the conjunctiva in adults, the main share sums up to 90% of gram-positive microorganisms, including 55-78% - coagulase-negative staphylococci: S. epidermidis, S. hominis, S. saprophyticus, S. capitis, S. intermedius, S. warneri, S. lugdunensis, S. aureus, etc. In blepharitis, staphylococcal infection affects the base of the eyelashes, causing chronic inflammation. A favorable factor for the development of staphylococcal blepharitis is a weakened immune system, endogenous and exogenous infections, as



well as dysbiosis. Staphylococci produce toxins and enzymes that are pathogenic to cells and disrupt their vital activity. Hypersensitivity to the staphylococcal exotoxin can also lead to inflammation of the inferior tarsal conjunctiva and pinpoint erosion of the cornea, usually affecting its lower third (Fig. 8). Complications of staphylococcal blepharitis include the development of external styes, as a result of the spread of infection to the glands of Moll and Zeis. In severe cases, abscesses of the eyelash follicles may occur.

Diagnostics

Complaints: discomfort and a feeling of a foreign body in the eyes, sticking of the eyelash edges, itchiness and burning in the eyelids, eye fatigue, etc.

Biomicroscopy: signs of staphylococcal blepharitis are inflammation, hyperemia, telangiectasia of the outer eyelid edges, as well as the presence of scales. The scales in staphylococcal blepharitis are dry, brittle and hard, located at the base of the eyelashes. After removing such scales, small ulcers often remain at the edge of the eyelid, which tend to deepen and hypertrophy. Sometimes the eyelashes curl inward, causing a feeling of a foreign body in the eyes and corneal damage. The progression of the process is accompanied by scarring of the edge of the eyelid, which leads to incorrect growth of the eyelashes.

Microbiological research: It is carried out to determine the pathogen and its sensitivity to antibiotics: levomycetin, ampicillin, carbenicillin, ofloxacin, tobramycin, erythromycin, gentamicin, ciprofloxacin, doxycycline.

Tests for tear production and meibomian gland dysfunction: in order to diagnose DES and to decide on the advisability of prescribing tear replacement therapy, a Schirmer test is performed, a decrease in which indicates the secretion disorder of the aqueous phase of the tear film, as well as a compression test and a test for TFBUT. Changes in the indicators of these tests are a consequence of the MGD and a prescription for tear replacement therapy.

Treatment

Treatment of blepharitis of staphylococcal etiology is aimed at eliminating the infectious agent and restoring the functional state of the meibomian glands and includes non-drug and drug forms of therapy.

Non-drug therapy

Eyelid hygiene is carried out in order to cleanse the surface of the eyelids, to stop the inflammatory process and toxic-allergic reactions, resulting from the vital activity of bacteria, as well as drainage of the meibomian glands. Hygiene procedures include the following:

- warm compresses with a Blepharowipe / Blepharolotion;
- self-massage of the eyelids with Blepharon 2 in accordance with the diagram.

Physiotherapy is carried out with the aim of improving the secretion outflow from the meibomian glands in the form of phonophoresis with Blepharon 2. In some cases, physiotherapy is performed with an antibacterial product in order to facilitate its diffusion into the eyelid tissue and increase the effectiveness of antibacterial therapy.

Drug therapy

The basis of drug therapy for blepharitis of staphylococcal etiology is antibiotic therapy. In the presence of allergic signs, "dryness" of the eyes, involvement in the pathological process of the conjunctiva and cornea, the prescription for drug therapy are expanded and treatment regimens include the following groups of products:

- antibiotics (tetracycline ointment, Tobrex drops, Cipromed, etc.). The course is 7 10 days;
- antiseptics (Vitabact, Okomistin, etc.) are prescribed after a course of antibiotic therapy while maintaining signs of inflammation a course of 7-10 days;
- **antihistamines** (Opatanol, Lecrolyn, etc.) are prescribed if there are signs of an allergic reaction. The course is 7 10 days;
- steroids (hydrocortisone eye ointment, Prenacid, etc.) are used in cases of persistent blepharitis
 with pronounced signs of allergy. The course is 7-10 days, the products are applied to the skin of
 the eyelids 1-2 times per day. If necessary, they are placed under the lower eyelid once per day at
 night time. Combination therapy can be carried out using Dexa-Gentamicin Ophthalmic Ointment;
- reparative therapy (VitA-pos, Corneregel, Hilozar-chest of drawers) is prescribed when the cornea is involved in the xerotic process punctate epitheliopathy and conjunctival lesions coloring with vital colorants;
- **tear substitutes** (Hylo-Comod, Systane Ultra, Oftagel, etc.) are prescribed after patient's complaints are received regarding dryness and discomfort in the eyes, MGD (in accordance with the compression test), a decrease in the Schirmer test and TFBUT. The course is 1-2 months.

Recommended: observation of the hygienic regime, vitamin therapy, repeated course of eyelid hygiene after the end of treatment.

5. Allergic blepharitis

Allergic blepharitis is an acute erythematous-exudative skin disease of the eyelids. Mostly, it occurs as a reaction to the local effects of various allergenic medications and cosmetics in people with hypersensitivity to these substances. In accordance with the level of preliminary sensitization, skin lesions develop more or less rapidly. As a rule, there is a bilateral lesion. However, in some cases, a unilateral reaction can be developed. It is characterized by a rapidly advancing hyperemia and edema of the skin of the eyelids, leading to them being narrowed (Fig. 9). In addition, an allergic reaction



can occur due to chronical toxic-allergic effects of microbial, parasitic and viral agents. These clinical situations are described in the sections of demodectic and seborrheic blepharitis.

Complaints: itching, burning, swelling of the eyelids is recorded.

Biomicroscopy: edema, hyperemia of the eyelid skin, sometimes with a bluish tinge, multiple skin wrinkles. As a rule, at the stage of edema resolution, a pronounced peeling of the skin is recorded.

Treatment

Allergen-specific desensitizing immunotherapy is prescribed after the identification of the causative allergen.

- Antihistamines are prescribed topically and orally, depending on the severity of the allergic reaction. Topical: Opatanol, Lecrolyn, Spersallerg, etc. are prescribed if there are signs of an allergic reaction. The course is 7-10 days. Oral intake: Suprastin or Zyrtec, 10 mg (1 tablet or 20 drops) are to be taken 1 time per day at any time. The dose is halved to children under 6 years of age. Drops for children are diluted in any liquid.
- Steroids (hydrocortisone eye ointment, Prenacid, etc.) are used in cases of persistent blepharitis with pronounced signs of allergy. The course is 7-10 days, the product is applied to the skin of the eyelids 1-2 times per day. If necessary, it is placed under the lower eyelid once per day at night time. In addition, combination therapy can be performed using Dexa-Gentamicin Ophthalmic Ointment.
- **Tear substitutes** (Hylo-Comod, Vid-Comod, Oftalik preservative free, Hylobak, Visine pure tears preservative free**, etc.) are prescribed after signs of relief of an acute allergic reaction still maintaining complaints of "discomfort" in the eyes. The course is 1-2 months.

Eyelid hygiene is carried out after the signs of relief of an acute allergic reaction to eliminate the MGD caused by edema, restore turgor and moisturize the skin of the eyelids. Hygiene procedures include the following:

- warm compresses with a Blepharowipe / Blepharolotion;
- self-massage of the eyelids with Blepharon 1 *** in accordance with the diagram.
- * When gathering data on the anamnesis of patients with allergic blepharitis, it is very important to determine which factor has caused this reaction. In recent years, patients have widely used cosmetics with active ingredients, in particular, based on the placenta, or ointments for eyelash growth. These products, with prolonged uncontrolled use, cause sensitization and can lead to development of severe allergic reactions.
- ** Tear replacement therapy for pathological conditions of the eyelids and the ocular surface, with elements of allergization, is performed using products that do not contain preservatives.
- *** Signs of an allergic reaction are an indication for prescription of Blepharon 1, which does not contain sulfur.

IV. Eyelid hygiene in the preventative treatment of postoperative complications, blepharitis and the "dry eye" syndrome.

1. Preoperative preparation

Over the past few years, there have been reports indicating the necessity for eyelid hygiene in patients before eye surgeries. The justification for prescribing eyelid hygiene when preparing patients for surgery is explained by several factors.

It is known that a violation of the stability of the tear film caused by ophthalmic surgery, as well as a decrease in the production of anti-inflammatory mediators, lysozyme under stress conditions, caused by the operation, leads to an increase in the virulence of opportunistic microorganisms. Therefore, cleansing of the eyelid surface will reduce the risk of postoperative complications. Also, most of the patients undergoing keratorefractive surgery (particularly, excimer laser vision correction) use contact lenses for a long period of time, which not only reduce the stability of the tear film, mechanically destroying it, but also provoke the development of MGD. Consequently, eyelid hygiene will restore functions of the meibomian glands and reduce the risk of DES in the early postoperative period. Extraction of cataracts and antiglaucoma operations, as a rule, are performed in elderly patients, the incidence of blepharitis and DES in whom reaches up to 60-70%. Performence of hygienic procedures will allow to cleanse the eyelids and restore functions of the meibomian glands, thereby preventing the development of postoperative complications of infectious and non-infectious genesis. Taking into account these factors, in order to reduce the risk of postoperative complications, it is recommended to carry out a weekly course of eyelid hygiene, including warm compresses with a Blepharowipe and self-massage of the eyelids with Blepharon 1 or Blepharon 2.

Eyelid hygiene for the preventative treatment of postoperative complications includes the following:

- warm compresses with a Blepharowipe / Blepharolotion;
- self-massage of the eyelids with Blepharon 1 in accordance with the diagram.

2. Preventive treatment of styes and chalazions

Styes and chalazions (meibomian cysts) usually develop in the background of blepharitis. Stye is caused by a bacterial infection (in 90-95% of cases with Staphylococcus aureus) and is most often observed in patients with a weakened immune system (for example, after colds). External and internal styes are distinguished. External stye (hordeolum) is an acute purulent inflammation of the eyelash hair follicle or Zeis sebaceous gland, which is located near the eyelash bulb. Internal stye is an acute staphylococcal infection of the meibomian gland or its lobule. The contents of such a focus are released at the posterior edge of the eyelid. The symptoms of both forms are inflammation and swelling of the eyelid edges, redness, soreness. Stye goes away on its own and the necessity for antibiotics and surgery is rare. It is usually necessary for patients with internal stye.

Meibomian cyst. The reason for the development of a meibomian cyst, or chalazion, is a blockage of the meibomian gland duct, a fatty gland of the cartilaginous plate of the eyelid. The cyst contains sebum and becomes inflamed with formation of walls made of granulomatous tissue. A large cyst can press on the cornea and cause astigmatic visual impairment. Chalazion is usually round in shape, it is hard to the touch and, when the eyelid is everted, looks like a granuloma. If relapses occur, biopsy should be performed and meibomian carcinoma and basal cell carcinoma should be excluded. Most cysts go away without treatment, but if they persist, they are excised and scraped out under local anesthesia, then an antibiotic ointment is applied and the eye is tightly sealed with a plaster for several hours.

Therefore, to prevent the development of stye and chalazion, it is necessary to regularly cleanse the eyelid surface and drain the sebaceous glands of the eyelid. For this purpose, eyelid hygiene courses are carried out.

Eyelid hygiene for the prevention of styes and chalazions includes the following:

- warm compresses with a Blepharowipe / Blepharolotion;
- self-massage of the eyelids with Blepharon 1 in accordance with the diagram.

3. Preventative treatment of the lipid deficiency dry eye syndrome:

during work at the computer

Research in the field of studying the effect of computers on the human eye have shown that complaints of one in six patients who see ophthalmologists are associated with prolonged work on the computer. When working at the computer and looking at the monitor for long hours, a number of complaints appear both from the body as a whole and from the eyes, in particular. Ophthalmic symptoms experienced by computer users have been collectively referred to as computer vision syndrome (CVS).

Changes that can occur in the organ of vision during prolonged work at the computer are the occurrence (or progression if already existing) of myopia and meibomian gland dysfunction, followed by development of the "dry eye" syndrome.

As a rule, in patients with CVS, the initial occurrences of DES, often sub-clinical forms, are recorded. However, the use of pathognomonic therapy, eyelid hygiene and tear replacement therapy, can restore the stability of the tear film and prevent the development of conjunctival-corneal xerosis.

Eyelid hygiene is prescribed for the prevention of CVS as follows:

- warm compresses with a Blepharowipe / Blepharolotion;
- self-massage of the eyelids with Blepharon 1 in accordance with the diagram.

Tear substitutes (Hylo-Comod, Hylomax-Comod, Systane Ultra, Oftagel, Oftalik, Systane Balance, etc.) – are prescribed after patient's complaints are received regarding dryness and discomfort in the eyes, MGD (in accordance with the compression test), a decrease in the Schirmer test and TFBUT. The course of treatment is 1-2 months.

• when wearing contact lenses

It is known that wearing contact lenses not only destroys the tear film, but also leads to mechanical pressure on the meibomian glands, hence to the development of MGD. Also, contact lenses mechanically affect the conjunctiva, resulting in the phenomenon of squamous metaplasia with a violation of the morphology and function of the conjunctival goblet cells, the secret of which is necessary for the formation of a proper mucin layer of the tear film. These factors contribute to the development of DES. Considering the fact that patients, which use contact lenses, are usually young people working in offices and receiving additional stress on the ocular surface in the form of exposure to conditioned air and radiation from computer monitors, the risk of developing corneal conjunctival xerosis increases. According to the statistics, one in three users of computer devices regularly shows symptoms of dryness and irritation of the ocular surface. The use of contact lenses intensifies these manifestations. It should be noted, that in some cases this leads to a deterioration in the tolerance

of contact lenses and is often the reason for patients' refusal to use means of contact correction. In order to restore the lipid layer of the tear film and compensate for the pre-corneal tear film, it is recommended to carry out eyelid hygiene and tear replacement therapy.

Eyelid hygiene is carried out to prevent the development of corneal-conjunctival xerosis as follows:

- warm compresses with a Blepharowipe / Blepharolotion;
- self-massage of the eyelids with Blepharon 1 in accordance with the diagram.

Tear substitutes (Hylo-Comod, Systane Ultra, Systane Balance, Oftagel, Oftalik, VidComod, Hylobak, etc.) are prescribed for complaints of dryness and discomfort in the eyes, MGD on a compression test, a decrease in the Schirmer test and TFBUT. The course is 1-2 months.

Thus, based on many years of experience in monitoring patients suffering from blepharitis, meibomian gland dysfunction, as well as the "dry eye" syndrome, inextricably linked with these pathological processes, we can conclude that timely diagnosis and complex therapy, including eyelid hygiene, allows not only to stop inflammation and stabilize the tear film, but also to significantly improve the quality of the patients' life.

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