

An Overview on Dry Eye Disease Evaluation and Management Approach in Primary Health Care Centre

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Abstract

Dry eye disease (DED) was previously characterized as a tear film disease caused by tear deficit or extreme evaporation, caused injury to the inter-palpebral ocular surface and ocular discomfort. Due to ocular discomfort, difficulties completing everyday tasks, and depression, patients with moderate-to-severe DED may have a worse quality of life. DED is a rapidly developing health concern with an increasing global prevalence. Therefore, the physician needs to acquire adequate knowledge about this disease to provide the best management to the DED patients. A literature review of published works on dry eye disease, evaluation, risk factors, and management. Article selection was performed in the Pub Med database with the mentioned mesh chief points (“dry eye disease”[Mesh]) AND (“management”[Mesh]) OR (“risk factors”[Mesh])). The physician faces significant difficulty when it comes to treating DED. The major goals of DED treatment are to enhance the ease of a patient’s life, as well as to restore the ophthalmic surface and tear film to their natural homeostatic condition. It is recommended for the physician to start the first step in managing DED with prevention. However, the core of DED therapy is the use of over-the-counter ocular lubricants to enhance humidity at the ocular surface. Additional medications and dietary supplementations have been suggested also in the literature.

Keywords: Dry eye disease, Diagnosis, Management, Evaluation

INTRODUCTION

DED also known as kerato-conjunctivitis sicca, is a multifactorial ocular surface illness whose main trait is loss of tear film homeostasis, as well as symptoms including ocular pain and visual impairment [1, 2]. DED prevalence estimates range from 5% to 33%, which might be due to a variety of factors, including different demographics and conflicting diagnostic criteria. Due to ocular discomfort, difficulties completing everyday tasks, and depression, patients with moderate-to-severe DED may have a worse quality of life. There is also a major social cost, both indirect like decreased job productivity and direct such as increased healthcare expenditures and treatment costs [3].

Many patients assume that once they start therapy for DED, their symptoms will improve immediately. The physician must explain to the patient the need for continuing therapy and the fact that effects will not be seen right away. The patient should also be informed that side effects from the therapy, such as instillation site pain, are possible [1].

MATERIALS AND METHODS

PubMed database was used for articles selection, and the following keys were used in the mesh (“dry eye

disease”[Mesh]) AND (“management”[Mesh]) OR (“risk factors”[Mesh])).

The inclusion of dry eye disease, risk factors, diagnosis, and management in the paper articles made them part of the required works while their exclusion ruled out the article.

RESULTS AND DISCUSSION

DED was previously characterized as a tear film disease caused by tear deficit or extreme evaporation, which caused

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damage to the interpalpebral ophthalmic surface and ophthalmic uneasiness. The 2007 International Dry Eye Workshop expanded the concept of DED to include a multi-elemental illness characterized by pain, visual disturbance, and tear film instability, as well as possible ocular surface injury, as well as increased tear film osmolarity and swelling [4, 5].

DED is a rapidly developing health concern with an increasing global prevalence. In the United States, around 16.4 million individuals have been diagnosed with DED, and another 6 million have DED symptoms but do not have a confirmed diagnosis. DED is more frequently seen in females and older people [3, 6]. It is, however, on the rise among the young, with 25% of high school students and 30 to 65% of office employees being affected as indicated by a recent study. The use of digital gadgets and refractive therapies, such as contact lens use and refractive laser, have been related to DED symptoms in young people [7].

Increased understanding of the link between DED and autoimmune illnesses, changes in hormones, and systemic medication treatments have also led to more clinicians in other specialties recognizing DED symptoms. Because of discomfort, pain, and decreased visual acuity, DED has a significant detrimental influence on patients' physical and psychological well-being, prohibiting them from doing fundamental everyday activities such as watching television, reading, working, and driving [3].

Patient-reported sadness, stress scores, and anxiety are all highly linked to the symptoms. Suicidal ideation is more common in individuals with extreme DED, highlighting the devastating influence of DED on living standards. DED has a significant financial influence as well. DED symptoms were reported to be equivalent to those of angina in one healthcare utility evaluation research. The projected yearly costs vary from as high as USD 1100 in the United Kingdom to USD 270 in France for the direct management of treatment by an ophthalmologist [8].

Furthermore, when lost job productivity is factored in, the financial impact grows tremendously. DED costs around \$4 billion in direct healthcare each year in the United States, and it costs up to \$55 billion in lost productivity each year [9]. There has been a lot of study on the subject of DED and ocular surface health because of the growing public health relevance of DED [6].

Risk Factors

Advanced age, female sex, estrogen therapy after menopause, wearing of the contact lenses, computer use, an omega-3 essential fatty acid low diet, the lack of vitamin A, refractive surgery, radiation therapy, hepatitis C, bone marrow transplants, and specific ophthalmic medicational groups, are all risk factors for dry eye [10]. Inadequate vitamin A intake owing to alcohol-linked nutritional insufficiency, eating

disorders, malabsorption, stomach operation, and a vegan diet are all well-known risk factors for dry eye [11]. Diabetes mellitus, HIV and human T cell lymphotropic virus-1 infection, connective tissue disorders, systemic cancer treatment, and medicines, such as beta-blockers, isotretinoin, diuretics, anxiolytics, and antidepressants are all risk factors. However, a thorough examination of these variables is currently missing. On the relationship between dry eye and some variables, such as acne, alcohol, caffeine, smoking of cigarettes, and menopausal state, conflicting results have been reported. Similarly, there are limited studies on the risk of dry eye associated with pregnancy and oral contraceptive use [10, 12, 13].

Pathophysiology

Aqueous-deficient and hyper-evaporative DED are the two types of DED. However, these mechanisms are not mutually exclusive, and many patients with DED have a combination of them. Insufficient tear production is referred to as aqueous tear insufficiency, and the most prevalent reasons include Sjögren's disease (primary or secondary), lacrimal gland abnormalities such as impediments, or generic drugs that affect the production of tears. excessive tear film evaporation which is the characterization of hyper evaporative dry eye is prevalently caused by the disfunction of the meibomian gland. These glands are located at the corners of the eyelids and produce greases that form the tear film's lipid layer, decreasing tear evaporation. This dysfunction can be attributed to insufficient excretion owing to atrophy, gland dropout, or gland orifices block. Increased tear evaporation is caused by meager blinking (partial closure of the lid, low rate), lid orifice abnormalities, and environmental variables (low humidity, high airflow). The traits of DED are hyperosmolarity of the tear film, which can harm the ophthalmic surface directly or indirectly by producing inflammation. The release of inflammatory mediators and cause injury to the optical surface is triggered by hyperosmolarity of the tear film, which can further diminish tear film stability, leading to a 'vicious loop' of disease self-perpetuation. Other factors, such as ocular surface inflammation caused by allergic eye illness, topical preservative toxicity, or xerophthalmia, may start this pathologic cycle in addition to hyperosmolarity [14].

Meibomian Gland Health

DED is exacerbated by meibomian gland disorders. Meibomian glands release phospholipids, polar lipids, and non-polar lipids which increase the tear film viscosity and avert evaporation. Two basic concepts underpin the advancement of meibomian gland illness. Hyperkeratinization of the terminal ducts is induced by chronic inflammation caused by dust, the bacterial establishment of the eyelids, and other environmental elements, leading to glandular occlusion in one case [6].

Changed manifestation of the nuclear receptor peroxisome proliferator-activated receptor gamma (PPAR) is another

possibility. PPAR is a nuclear receptor protein that contributes to the development and purpose of Meibomian glands by controlling the differentiation of meibocyte and biosynthesis of lipids [15]. The reduced meibocyte differentiation and lipid synthesis was seen with age and other environmental stressors, resulting in gland atrophy and hyposalivation is considered to be due to PPAR downregulation. Variations in systemic sex hormones, mineralocorticoids, and glucocorticoids as well as other progressive elements, have been reported to alter the quality and viscosity of the meibum, resulting in the volatility of the tear film in turn heightening tear evaporation [16].

Increased tear osmolarity as a result of rapid evaporation might produce irritation as a side effect. Hyperosmolarity triggers an inflammatory cascade including mitogen-activated protein kinase (MAPK), matrix metalloproteinase-9 (MMP-9), tumor necrosis factor- α (TNF- α), and other interleukins. oral retinoic acid as medication has also been linked to Meibomian gland atrophy. In the clinic, Meibomian gland dysfunction is typically assessed by assessing gland thickening, clamping the Meibomian glands and ranking the extracted meibum's condition, and eyelid retro-illumination for gland degeneration [6].

Imaging tests that emphasize gland architecture, such as LipiView and Keratograph, can be used to support the clinical evaluation. In addition, doctors should check for rosacea, which can include telangiectasias on the face and eyelids and is linked to meibomian gland disease. Meibomian gland disease is treated with lid hygiene procedures at home and in clinics, as well as oral and topical medicines like doxycycline, which are considered to have an anti-inflammatory impact [17].

Anatomy

Dry eye symptoms can be caused by any structural abnormalities of the eyelid, including ocular discomfort owing to nociceptor commencement and meager inconsistent sight because of rapid vaporization and corneal epithelial erosions. Other common structural abnormalities of the eye that can lead to DED are conjunctival alterations which include conjunctivochalasis, pinguecula, pterygium, and conjunctival advancement following glaucoma operation. Moreover, eyelid modifications can be potential causes too, for example, ectropion, eyelid laxity, lagophthalmos, and entropion. As part of a dry eye assessment, these anomalies should be examined and addressed as appropriate [6].

Nerve Dysfunction

Nociceptive pain is a physiological pain response triggered by the nociceptors foundation in response to noxious incitements and cellular damage. In DED, a novel hypothesis is that, as well as correctly passing optical surface data, conjunctival and corneal nerves can be malfunctioning therefore wrongly conveying signals. This will result in ocular pain feelings, which is termed neuropathic pain. Therefore, nociceptive or neuropathic processes or their

mixture can be the cause of dry eye. Various assaults, such as tear hyper-osmolarity, surgical trauma, and air pollution, can damage trigeminal nerve endings. the upregulation of the Voltage-gated ion channels is a result of chronic damage to the nerve terminals. This causes aberrant ectopic activity and hypersensitivity to stimuli, resulting in feelings of dryness, discomfort, and pain. In a process called central sensitization, chronic peripheral nerve stimulation can change the increased indicating neural circuits. These processes lower the pain threshold and cause enhanced pain perception (hyperalgesia) even in the presence of non-painful stimuli (allodynia). There is a possibility of the unnatural excitability to become permanent even after the skin looks like it has been healed [18].

To emphasize that the origin of pain could be the eye nerves (cornea and conjunctiva) or much deeper rooted neurons connecting to the brain to the optical surface, the term "neuropathic ocular pain" was coined. Risk factors of neuropathic ocular pain development are recurrent discomfort and migraine, and central sensitization is considered to be the connection between the two [19].

There are currently no gold-standard testing methods for detecting neuropathic ocular discomfort. Certain sting signifiers (sudden itch due to wind or light, the ocular equivalents of allodynia and hyperalgesia); risk factors like lingering general ache, migraine, or previous refractive surgery; and a disconnect between signs and optical pain have all been found to help indicate a neuropathic element to optical discomfort. Confocal microscopy has proved useful in detecting people with structural abnormalities by identifying micro-neuromas but it is not commonly employed in clinical practice. Treatments for neuropathic ocular pain are being developed, and they include treating all nociceptive ache origins initially (bettering the tear and Meibomian gland wellbeing). Scleral contacts might be utilized to keep the ocular surface lubricated at all times. Various treatments have been applied in individuals with ongoing symptoms despite ocular surface optimization, drawing on the knowledge on the outer eye neuropathic ache management. Oral medications with $\alpha 2$ ligands (pregabalin and gabapentin), auxiliary stimuli therapies, botulinum toxin injections, and topical therapy with autologous serum tears are all options. Because of the condition's novelty, the optimal treatments are currently unknown [20].

Clinical Features

There are often presented subjective symptoms that are nonspecific in DED, such as redness, stinging, feeling of foreign bodies, etching, photophobia, and pruritus [21]. Dry eye is characterized by more or less severe conjunctival redness and optical surface damage with punctate epithelial erosions (superficial punctate keratitis); parallel temporal conjunctival folds in lid margin are suggestive. The subdued tear meniscus is thinned down. Furthermore, enlarged eyelid margins and telangiectasia are common indications of

meibomian gland dysfunction. A hazy, granular, or solid secretion blocks the orifices of the meibomian glands, which may only be shown by putting substantial weight on the lower lid [22].

Blepharitis (irritation of the edge of the lid) or meibomitis (meibomian glands swelling) may be present if meibomian gland dysfunction is accompanied by inflammation. Conjunctival scarring or corneal problems might arise in the late stages of severe types of the illness. In addition to filamentary keratitis, the course might be complicated by chronic epithelial abnormalities, ulceration, and even corneal perforation. Severe DED complications are uncommon, although they can occur in the setting of Sjögren's syndrome, ichthyosis, Stevens-Johnson syndrome, graft-versus-host disease, and xerophthalmia. They could be the outcome of the loss of sight or practical blindness [9, 23].

DED has been classified depending on the sternness of symptoms and medical findings. However, particular and impartial clinical results may not always concur. Patients with extreme dry eye and sight-threatening ophthalmic problems have only moderate symptoms, whilst others have only mild symptoms [16].

Diagnosis

These analytical checks are required to differentiate among allergies, dry eye, and contaminations which might appear clinically alike but need separate treatments. Dry eye can become worse if an inaccurate medical analysis is established and antiallergic medicines or epithelio-toxic antibiotics are administered. As we mentioned earlier, DED patients are grouped into subgroups based on the treatment: hyper-evaporative or aqueous-deficient [21].

Blinking and blink rate are necessary for distributing tear fluid throughout the optical surface and supporting meibomian gland function. While speaking, the typical blink rate is very diverse, ranging from 15.5 ± 13.7 blinks per minute. The blink rate is considerably lowered while reading and computer activity, to 5.3 ± 4.5 blinks/minute, which improves tear fluid vaporization. Patients have shorter downtimes, ranging from around 6 seconds to 2.6 seconds, between blinks in addition to partial blinking. Lid incongruity, Lid congruity, and lid closure (e.g., ectropion, entropion), and inadequate lid closure like nerve palsy of the face can compromise the veracity of the tear film on the ocular surface and require surgical correction [23, 24].

A thorough examination of the eyelid edge will reveal any inflammation or malfunction of the meibomian glands, as well as any hyper-evaporative condition that may be present. The slit lamp is used to inspect the meibomian gland orifices, eyelid border, and eyelashes. The meibomian glands can be seen directly via noncontact infrared meibography.

Increased friction between the lids and the conjunctiva causes partial lid-parallel conjunctival folds (LIPCOFs) in a constant glare. They have a sensitivity of 84.9 percent and a specificity of up to 90 percent, making them a significant indication of dry eye. The slit light can easily, rapidly, and noninvasively identify them.

The slit lamp and vital stains are used to evaluate the surface of the eye. Fluorescein and lissamine green are the most often used dyes in clinical practice. The precorneal tear film, as well as epithelial erosions in the conjunctiva and cornea, are stained with fluorescein. Lissamine green highlights cells with a deficient mucin layer that are superficially injured. The intensity of staining and the dye distribution pattern are evaluated semi-quantitatively for all dyes. Dry eye is indicated by staining around the palpebral fissure [25].

During the slit lamp examination, the tear film height meniscus might reveal the existence of hyposecretory dry eye. Optical coherence tomography may be used to evaluate the tear film objectively. The height of the tear meniscus was 0.2 ± 0.09 mm in dry eye patients versus 0.5 ± 0.02 mm in healthy eyes. A torn semilunar cartilage of less than 0.2 mm is considered abnormal in clinical practice. In individuals with meibomian gland dysfunction, a transformed lipid layer is indicated by a foamy tear film [26].

The tear film's stability is measured by the tear film break-up time. It is measured a cobalt blue filter on a slit lamp following the installation of unpreserved fluorescein drops without topical anesthetic. The time it takes for the tear film to break apart for the first time is measured after a total blink. The usual time range is 20 to 30 seconds. Values of less than 10 seconds are unquestionably abnormal. Video keratography can be used to measure tear film break-up time noninvasively and without the use of fluorescein.

The Schirmer test evaluates the lacrimal gland's secretions. The Schirmer I test involves placing standardized strips of filter paper (35 x 5 mm) in the conjunctival sac of the sequential third of the subdued eyelid and measuring wetting of the strip after 5 minutes of shut-eye by the patient. The assessment is challenging due to substantial inter-and intraindividual variations. However, in aqueous-deficient dry eye, both the absolute values and the range of fluctuation are lowered, most likely due to decreased reflex tear production. A value of 5 or below is unquestionably abnormal.

The osmolarity of the tear film is an essential additional test in the dry eye evaluation. Clinical studies are now being conducted on a portable osmometer for the analysis of the tear film in normal clinical practice. Clinical trials are also evaluating a fast test to identify individuals with DED and their MMP-9.

However, none of these methods is yet part of the conventional diagnostic repertoire due to a lack of data and

somewhat contradictory outcomes. A decreased tear meniscus, LIPCOFs, and a low Schirmer I test score are all indicators of tear deficit. Pathological alterations to the margins of lids blocked the orifices of the meibomian gland, and thicker meibomian gland excretion is common in patients with hyper-evaporative dry eye. The time it takes for a tear film to shatter is lowered. Both types can cause increased osmolarity of the tear film and optical surface injury.

Patients with xerostomia who also have dry eyes should be checked for Sjögren's syndrome. A positive rheumatoid factors or ANA (antinuclear antibody) test or could be suggestive if SSA/SSB evaluation is not present.

Complications

Tears shield the ocular surface from contamination in extreme situations of untreated DED, but the linked swelling can damage the conjunctiva and cornea, increasing the likelihood of contagion. The majority of conjunctivitis episodes produced by dry eyes are mild and do not require treatment. Before the corneal surface is disrupted, resulting in irreparable ulceration or scarring, early and effective treatment is necessary if the inflammation becomes severe and chronic. High light sensitivity, pain, irritated eyes, and vision loss are some of the more severe symptoms that can result from these issues [10, 27, 28].

Management

The physician faces significant difficulty when it comes to treating dry eyes. The major goals of DED treatment are to relax the patient while increasing the life quality as well as to restore the tear film and optical surface to their natural homeostatic condition. Signs are seldom completely gone, although they can usually be improved [4].

It is recommended for the physician to start the first step in managing DED with prevention. Primary health care practitioners are well-positioned for this task as such disease can be encountered frequently in primary health care centers. Nevertheless, long periods of reading, being hooked to a computer screen for prolonged hours, using the contact lens long-term, rapid air-current flow, decreased dampness like on passenger flights, and first contact to compounds as in respired cigarette smoke are all moderate risk factors that may be controlled or avoided [29]. Long-term usage of a digital gadget like a computer screen reduces the rate of blinking and causes eye stress. Certain occupations are risky, necessitating personnel to exercise caution when it comes to decreased production of tears or their higher vaporization degrees [30, 31].

World pollution provides climate risks to DED that occur according to geographic location. Lengthy eye exposure in places with strong winds, such as sandy (desert sand with foreign body danger) or polar (desiccating) environments, can cause environmental stress. Technology advancements have ironically increased awareness of visual ergonomics.

The term "computer vision syndrome" was developed to show screen-induced sight stress. The American Optometric Association promotes having a 20-second break every 20 minutes and staring at an item 20 feet away. Adding 20 times of vigorous blinking moistens the optical surface. The repetitive approach promotes the formation of a sufficient tear film between blinks, improves visual clarity, and preserves the health and turnover of ocular service cells [5].

Some medicines, such as those recommended for hypertension, depression, or antihistamines, decrease tear production. Therefore, when particular prescriptions for the aforementioned illnesses are provided, the physician must inform the patients about adverse effects. Humidification, as well as deliberate, vigorous blinking, are necessary. When working in a windy or warm environment with bright sunshine, wearing protective glasses or shades efficiently protects eyes from ocular surface desiccation.

The core of DED therapy is the use of over-the-counter ocular lubricants to enhance humidity at the ocular surface. Ophthalmic gels used overnight, as well as twice-daily artificial tear replacement, help to maintain moisture levels. Warm eye compresses help to increase Meibomian gland production and smooth the surface of the eyes, and extra lid cleanliness is recommended [29].

Due to the danger of contamination, products that are taken in series frequently contain benzalkonium chloride or other preservatives. Preservatives, in general, have local harmful effects [32, 33]. There are now solutions on the market that include no or less harmful electrolytes, ions, and preservatives, and are less irritant to patients, but there is no proof of the preferability of one agent to another [4].

Eye drops containing autologous and umbilical cord serum remedy extreme dry eye. Containing the necessary chemicals for the normal ocular surface epithelium to proliferate, differentiate, and mature. Secretagogue medicines, which increase aqueous excretion, mucin excretion, or both, have shown promising effects in human and animal studies [34].

Swelling is a major contributing factor to DED. Cyclosporine-A has been shown to relieve symptoms as well as impartial testing including corneal staining and Schirmer values. Corticosteroids are an excellent anti-inflammatory treatment for DED, but because of steroid side effects, they must be used with caution and preference in the short term.

Tetracycline and its derivatives have been shown to have antibacterial, anti-inflammatory, and anti-angiogenic characteristics, making them ideal for treating acne rosacea and meibomian gland dysfunction [28, 33, 34].

Omega-3 essential fatty acid dietary supplements have proven to be effective in the management and prevention of DED. Topical omega-3 alpha-linoleic acid demonstrated a

substantial reduction in the symptoms of dry eye and swelling alterations at both the molecular and cellular levels in recent research. It has been suggested that high parenteral dosages of vitamin D therapy reduced DED by lowering the swelling of the optical surface, increasing tear production, and lowering tear instability, however, this is no longer advised as a first-line treatment [4, 29].

CONCLUSION

The physician faces significant difficulty when it comes to treating DED. The major goals of DED treatment are to enhance the ease of patient's life, as well as to restore the optical surface and tear film to their natural homeostatic condition. It is recommended for the physician to start the first step in managing DED with prevention. However, the core of DED therapy is the use of over-the-counter ocular lubricants to enhance humidity at the ocular surface. Additional medications and dietary supplementations have been suggested also in the literature.

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