

OCULAR SURFACE DISEASE IN SJÖGREN'S SYNDROME: MANAGEMENT IN A SCLERAL LENS CLINICAL PRACTICE

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ABSTRACT

Sjögren's syndrome is a chronic, autoimmune, systemic disease characterized by lymphocytic infiltration and malfunction of the exocrine glands, primarily the lacrimal and salivary glands, resulting in predominant symptoms of dry eye and dry mouth. Sjögren's syndrome is a highly prevalent condition and is one of the most common systemic, rheumatic, autoimmune diseases, affecting up to 1.4% of adults in the United States, second only to rheumatoid arthritis in its prevalence in North America. Primary Sjögren's syndrome has shown to affect patients' health-related quality-of-life due to dryness, chronic pain, depression, anxiety, physical and mental fatigue, and neuropsychiatric symptoms.

Scleral lenses (SLs) have shown to be significantly beneficial in relieving symptoms and improving quality-of-life in patients with Sjögren's syndrome and dry eye disease. SLs may be used concurrently with the other therapies including ocular lubricants, eyelid hygiene, punctal occlusion, topical prescription medications, and autologous serum.

This manuscript reviews the implication of Sjögren's syndrome on the ocular surface and quality-of-life and describes how SLs, in combination with other treatments, may be beneficial.

Key Words: Sjögren Syndrome, Scleral Lens, Dry Eye, Quality-of-Life

Sjögren's syndrome is a chronic, autoimmune, systemic disease characterized by lymphocytic infiltration and malfunction of the exocrine glands, primarily the lacrimal and salivary glands, resulting in predominant symptoms of dry eye and dry mouth.¹ Additionally, manifestations of the disease may be found in many systems including musculoskeletal, vascular, pulmonary, gastrointestinal, neurological,

lymphatic, gynecological and renal.² The mean age at diagnosis is roughly 50 years.³

Sjögren's syndrome is a highly prevalent condition and is one of the most common systemic, rheumatic, autoimmune diseases, affecting up to 1.4% of US adults, second only to rheumatoid arthritis in its prevalence in North America.⁴ Two forms of the syndrome have been defined: primary Sjögren

syndrome, in which dysfunction of the exocrine glands occurs in the absence of other autoimmune diseases, whereas secondary Sjögren syndrome is associated with another underlying rheumatic disease, such as systemic lupus erythematosus, rheumatoid arthritis (RA), or scleroderma.³

Nine out of 10 patients diagnosed with Sjögren's syndrome are women.⁵ Proposed factors contributing to these sex disparities are differential immune regulation,⁶⁻⁸ X-chromosome gene dosage effects,^{8,9} sex hormones,^{10,11} and sex-specific exposure to environmental factors.^{12,13} Additionally, the clinical manifestations of autoimmune diseases can differ between the sexes.^{5,14}

The main ocular implication of Sjögren's syndrome is dry eye.¹⁵ Ocular symptoms include dryness, pain, stinging, burning, itch, epiphora, blurring or interrupted vision eye, irritation (foreign-body sensation) and photophobia.¹⁶ Other symptoms include chronic pain, depression, anxiety, physical and mental fatigue and neuropsychiatric symptoms. These symptoms affect health-related quality-of-life in patients with Sjögren's syndrome.^{17,18}

Various studies demonstrated that SLs are a valuable option in the treatment and therapy of Sjögren's syndrome and dry eye diseases.^{19,20} The benefits of SLs in dry eye disease consistently improved comfort, visual function, and quality-of-life.²¹ Tear Film and Ocular Surface Society DEWS II proposed the use of SLs in the third step of the management algorithm.¹⁹ This indicates that SLs may be used when other management strategies in the earlier steps fail, or concurrently with the other therapies which include ocular lubricants, eyelid hygiene, punctal occlusion, prescription medications, and autologous serum.¹⁹

CLASSIFICATION AND MANIFESTATION OF SJÖGREN'S SYNDROME

Recently, a new classification criterion has been endorsed and published by the American College of Rheumatism and the European League Against Rheumatism.²² This criterion has replaced two previous approaches, the American-European Consensus Group, and the American College of Rheumatism classification.²² The new criterion integrates elements

from the previous practices and eliminates some that are considered invalid. The new classification is based on five objective tests:

- Focal lymphocytic sialadenitis (cut-off/focus score ≥ 1);
- Anti-SSA/Ro positivity;
- Ocular staining (cut-off score ≥ 5 , or van Bijsterveld score ≥ 4 , in at least 1 eye);
- Schirmer's test result ≤ 5 mm/5 minutes in at least 1 eye;
- Unstimulated salivary flow rate ≤ 0.1 ml/minute.

The first two of these are considered the most significant and are given weights of 3, while the remainder are weighted at 1 each. Patients are classified to have primary Sjögren's syndrome if they have a total score of ≥ 4 , derived from the sum of the weights assigned to each positive test.²²

Dry eye and xerostomia (dry mouth) are hallmarks of Sjögren's syndrome. Ocular manifestation of Sjögren's syndrome²³ are summarized in Table 1.

OCULAR SURFACE DISEASE IN SJÖGREN'S SYNDROME

Ocular surface disease in Sjögren's syndrome is a product of lacrimal functional unit dysfunction.²⁴ There are numerous mechanisms for lacrimal gland dysfunction in Sjögren's syndrome. These include cholinergic blockade from autoantibodies to muscarinic acetylcholine receptor 3, inhibition of acinar secretion by inflammatory cytokines such as IL-1, cytokine-mediated epithelial cell death or replacement of acini by lymphocytes.²⁵

Multiple substances are produced by the lacrimal gland that support and protect the ocular surface.²⁶ These include growth factors (e.g., EGFs), antimicrobial factors (e.g., lactoferrin, defensins), anti-inflammatory factors (e.g., IL-1RA) and mucins. Reduced concentrations of these substances have been found in tears of patients with Sjögren's syndrome.^{27,28} Inflammatory mediators that cause ocular surface epithelial disease in Sjögren's syndrome include the matrix metalloproteinases (MMPs), inflammatory cytokines and T-helper (Th) cell associated cytokines. Increased production of MMP-3 and MMP-9 by ocular surface cells has been observed in Sjögren's syndrome.^{27,28}

TABLE 1 Ocular Manifestations of Sjögren's Syndrome

Structure	Manifestation	
Cornea	Corneal haze/scarring	
	Sterile corneal ulcer/infiltration	
	Corneal melt/perforation	
	Corneal punctate epithelial erosions	
	Corneal filaments	
	Corneal staining	
Conjunctiva	Tarsal conjunctiva	Papillary conjunctivitis
		Follicular conjunctivitis
		Cicatrizing conjunctivitis
	Bulbar conjunctiva	Conjunctival chemosis
		Conjunctival staining
Uveitis		
Episcleritis/scleritis		
Optic neuropathy/neuritis		
Orbital inflammation		
Retinal vasculitis		

Dry eye is the most common scenario in Sjögren's syndrome.¹⁵ Henrik Sjögren first described aqueous tear-deficient dry eye in 1933 as an ocular finding in patients with primary Sjögren's syndrome. Ocular symptoms in patients with Sjögren's syndrome include eye irritation (foreign-body sensation) that is constant and can affect their quality-of-life, and photophobia due to tear dysfunction and ocular surface disease.¹⁶ Other ocular symptoms include dryness, pain, stinging, burning, itch, epiphora, and blurring or interrupted vision.

Ocular testing in Sjögren's syndrome is well defined. The ocular staining score, described by the American College of Rheumatology-European League Against Rheumatism, uses a combination of corneal and conjunctival staining scores with lissamine green and sodium fluorescein and requires a result ≥ 5 for a positive diagnosis.²² An alternative criterion, described by van Bijsterveld, sums corneal and nasal and temporal conjunctival staining scores, each graded from 0-3.²⁹ The critical value is ≥ 4 in at least one eye. Additionally, dry eye disease symptoms must have been present for at least 3 months, as measured on a 0-10 visual analog scale.²²

Sjögren's criteria require the American College of Rheumatology-European League Against Rheumatism score²² while the Tear Film and Ocular Surface Society DEWS II report does not specify a preferred scale.³⁰ Acs et al. suggested that the Tear Film and Ocular Surface Society DEWSII recommended testing (non-invasive TBUT, osmolarity, ocular surface staining, tear meniscus height evaluation and meibomian gland and lipid layer assessment) should be applied to a large group of Sjögren's syndrome patients.³¹

QUALITY-OF-LIFE

The evaluation of health-related quality-of-life is crucial to understand the burden of the disease and the efficacy of the treatment. Primary Sjögren's syndrome has shown to affect patient's health-related quality-of-life due to dryness, chronic pain, depression, anxiety, physical and mental fatigue and neuropsychiatric symptoms.^{17,18} New findings have emerged from a large, associated-health, quality-of-life study, conducted by Comec et al., in a primary Sjögren's syndrome cohort.¹⁷

The Short Form 36 health survey (SF-36) demonstrated that health-related quality-of-life impairments were severe. Additionally, patients with high systemic activity, assessed with the European League Against Rheumatism Sjögren's Syndrome Disease Activity Index, reported more intense symptoms. Among all symptoms, dryness, pain and fatigue, evaluated with European League Against Rheumatism Sjögren's Syndrome Patient Reported Index, showed the highest scores and the strongest association with health-related quality-of-life. Along with these results, the authors concluded that the intensity of symptoms assessed with European League Against Rheumatism Sjögren's Syndrome Patient Reported Index is a stronger determinant of health-related quality-of-life impairment than systemic involvement assessed with the Sjögren's Syndrome Disease Activity Index. Therefore, while future therapeutic trials may use both the Patient Reported and the Disease Activity Indexes, the primary end point criteria should be based on the focus of the population. For example, if the objective is patients' well-being, Patient Reported Index should be used, while the Disease Activity Index, or one of its subscales, would be more appropriate where there is systemic involvement.¹⁷

Sexual activity may also alter the quality-of-life in women with primary Sjögren's syndrome.³² Women with Sjögren's syndrome often experience vaginal dryness and dyspareunia, along with glandular and extraglandular symptoms,³³ which affect the quality-of-life more than other symptoms.³⁴ It has been found that vaginal dryness was ten times greater in Sjögren's syndrome patients reporting an increase in sexual pain and the use of lubricants was five times greater in this group.³² Women rarely talk about sexual activity with their physicians, only 17.3% discussed vaginal problems.³² Depending on the cultural environment and social norms, women may be embarrassed to answer questions on sexuality. Depression is the most important predictor of sexual problems.³⁵ Referring women to gynecologists and sexologists may be beneficial.

MANAGEMENT WITH SLS

The 2017 Tear Film and Ocular Surface Society-DEWS II report suggests SLS as an option for the treatment and therapy of dry eye disease as tertiary

management in the staged algorithm. SLS may be used when other management strategies of the earlier steps fail or concurrently with other therapies.¹⁹

Benefits of SL Wear in Sjögren's Syndrome

The beneficial response of SL use in dry eye disease has been showed to be consistent regarding comfort, visual function, and quality-of-life. Patients in almost all studies demonstrated an improvement in both the Ocular Surface Disease Index and Visual Function Questionnaire, and significantly improved best-corrected visual acuity. There was no difference in the results based on the origin of dry eye syndrome. The length of SL wearing time was an additional important indicator of the benefits of SLS, with an average of 12 hours per day.²¹ The height of the corneal and limbal vault were found to be a factor contributing to positive outcomes, indicating a corneal vault of 200–300 microns and limbal vault of 100 microns as optimal heights.³⁶

A study evaluated the impact of SL wear on dry eye and quality-of-life in 41 eyes majorly with Stevens-Johnson syndrome (53.7%) and SS (26.8%).²¹ Diameters of SLS ranged from 16.00 to 17.50 mm, which facilitated successful SL fitting in patients with eyelid scarring (41.7%). All patients had a significant improvement in best-corrected visual acuity described as a gain of 2 or more Snellen lines. Dry eye symptoms such as irritation, photophobia and foreign-body sensation, assessed by Ocular Surface Disease Index questionnaires were reduced. Additionally, the comfort and quality of best-corrected visual acuity improved. The mean amount of time of SL wear was about 12 hours per day. Additionally, a statistically significant decrease in tear osmolarity was observed between baseline values and after 6 months of SL wear. The reduction in tissue damage, assessed by Bijsterveld corneal staining, was significant after 12 months. Quality-of-life involving physical problems, bodily pain, emotional problems, mental health, energy and vitality, and the general perception of health, measured with the SF-36v2 questionnaire, was also significantly enhanced after 12 months of SL wear.²¹

Ng and Sorbara presented a case report of a 55-year-old Caucasian male where SLS were used to manage severe ocular dryness secondary to an immune disorder suspected to be Sjögren's syndrome.³⁷

The patient presented with filamentous keratitis and a persistent epithelial defect with severe chronic superficial punctate keratopathy in both eyes, secondary to his autoimmune condition. The patient was primarily treated with Ocunox™ (Candorvision), Hylo™ Gel (Candorvision), Restasis® (cyclosporine ophthalmic emulsion) 0.05% and autologous serum tears 20% to manage the ocular dryness. Additionally, the patient had a tarsorrhaphy of the left eyelid to protect corneal integrity. Despite the use of ocular drops and the tarsorrhaphy, dry eye symptoms and signs persisted. After SL wear, the patient reported immediate relief of dry eye symptoms with an improvement of visual acuity. Also, SLs promoted healing and prevented reoccurrence of a persistent epithelial defect.³⁷

The Impact of SLs on the Ocular Surface in Sjögren's Syndrome

Another report assessed basal tear production, corneal sensation, corneal nerve density, and corneal nerve morphology after long-term wear of SLs in two groups, with distorted corneas (DC) and ocular surface disease (OSD) including primary dry eye syndrome, Sjögren's syndrome, ocular graft-versus-host-disease, post-refractive surgery dry eye syndrome, dry eye syndrome associated with blepharitis, and exposure keratopathy.³⁸ Significant changes in the lacrimal functional unit were found only in patients with DC probably because of the difference in disease pathophysiology between corneal irregularity and OSD. Furthermore, corneal sensation was increased only in the DC group. It should be stated that corneal sensation varies in dry-eye disease (DED) depending on the etiology. Primary DED is associated with hypoesthesia,³⁹⁻⁴¹ while Sjögren's syndrome is associated with hyperesthesia.^{42,43} Corneal nerve density and morphology showed no variation in both groups.³⁸

Specific Considerations when Fitting SLs for Sjögren's Syndrome

Caution is advised when fitting SLs in patients with Sjögren's syndrome. These patients appear more likely to present a higher risk of developing microbial keratitis.⁴⁴ Additionally, patients taking oral and/or topical corticosteroids which are responsible for reducing immunity have potential risk factors for developing an infection.⁴⁵⁻⁴⁹

However, few cases of microbial keratitis due to poor compliance have been reported during scleral lens wear. Compliance with hygiene appears to be higher in SL wearers since their ocular disease necessitates specific ocular hygiene. Therefore, the incidence of microbial keratitis in SL wearers may be lower than contact lens wearers of other modalities.⁵⁰

One case report described the rare occurrence of microsporidial stromal keratitis with polymicrobial keratitis in a patient with secondary Sjögren's syndrome and ocular cicatricial pemphigoid with SL use.⁵¹ The predisposing factors included dry eye disease, local and systemic immunosuppression, and the use of SLs. The patient had concomitant blepharitis which may have contributed to microbial keratitis.⁵¹ Drugs used to treat microsporidial keratitis and topical Fumagillin are considered the most effective treatment.⁵² The patient in the case report was treated with topical PHMB 0.02% (LVPEI Pharmacy, AP, India) and oral albendazole (Taj Pharmaceuticals Ltd, Gujarat, India) because Fumagillin was not available. The therapy failed and patient's condition worsened. Therapeutic penetrating keratoplasty and tarsorrhaphy were performed using an 80-year-old donor corneal tissue with incalculable endothelial cell density. The post-operative graft failed after 4 months and the patient had to wait for a planned keratoprosthesis.

Careful documentation, photodocumentation, and baseline measurements are essential to monitor ocular surface conditions and their potential alteration. If there is concern, a primary evaluation after 4–6 hours of SL wear is recommended to assess the presence of adverse events.⁴⁹ Preservative-free solutions are suggested to avoid preservative sensitivities. SLs should be optimally aligned circumferentially to avoid the influx of debris and air bubbles into the tear reservoir. SLs with a toric back surface, more than four meridians, quadrant-specific design, or molded/impression design allow an optimal lens alignment to the underlying sclera. Decreasing limbal clearance is also beneficial since this decreases debris influx beneath the lens.

Initially, limiting SL wearing time may be recommended.⁵⁰ If complications do not occur, wearing time may be increased gradually. Practitioners must discuss and clarify with patients the importance of hygiene,

proper care and management of SLs and cleaning and replacing storage cases and other ancillary devices. Recommendations must be confirmed, verified and reinforced during follow-up visits. It is important to recognize that patients may report a higher level of compliance than is factual, revealed by clinical signs and symptoms during examination. Improved collaboration and compliance will increase success rates and minimize complications and infections associated with SLs.

ADDITIONAL TREATMENTS

SLs are included as the third step in the management algorithm based on a sequence of four steps for the treatment of DED. The more severe the condition, the more likely it is to jump to the next level, with possibility to retain current therapies.¹⁹ Therefore, SLs may be prescribed when other management strategies of the earlier steps fail or concurrently with other therapies.¹⁹ Other treatments include ocular lubricants, eyelid hygiene, punctal occlusion, medications, and autologous serum.

Ocular Lubricants

Ocular lubricants are first line therapy in Sjögren's syndrome⁵⁴ It has been suggested to start with lubricant drops, and if necessary, to select more viscous drops.³ The viscosity is obtained from the addition of various enhancing agents (e.g., sodium CMC, HPMC, PVP-K30, PVA, PEG-400, propylene glycol, HP-guar, sodium hyaluronate) that provide an increase in lubrication, and an extended residence time on the ocular surface.¹⁹ In addition to viscous agents, certain tear supplements contain lipids to mimic the lipid component of the tear film. Drops containing lipids may also be beneficial, since the lipid layer prevents tear evaporation. There are a variety of lipids that best mimic natural meibum and include saturated and unsaturated fatty acids, phospholipids, and triglycerides.⁵⁵ The use of biological tear substitutes, especially autologous serum, has been described to be effective in patients with Sjögren's syndrome.¹⁹

Other options include ophthalmic ointments and hydroxypropyl cellulose inserts. Ointment treatments are the thickest of lubricants and adhere to the ocular surface longer than other tear or gel supplements. They

are generally used overnight to provide constant relief of dry eye symptoms during sleep. Hydroxypropyl cellulose is inserted in the inferior cul-de-sac and dissolves with the natural body temperature. Once dissolved, it creates a thicker tear film. It may be applied in a one-daily dose in the morning, however, when used overnight it may perform better. The thickness of these two treatments may induce blurred vision.⁵⁴

Recent reports have shown the effectiveness of tear supplementation in dry eye patients.^{56,57} A study compared the effect of three artificial tear substitutes on the signs, symptoms and inflammatory status in patients with dry eye disease and found that all therapies reduced signs and ameliorated tear stability. However, the treatment with carboxymethylcellulose, glycerine, castor oil, L-carnitine and erythritol demonstrated the greatest tendency to reduce inflammatory biomarker levels.⁵⁷

Topical lubricants are frequently used in patients with Sjögren's syndrome; 85% of patients with Sjögren's syndrome in North America use topical lubricants. Of these patients, 56% used preserved solutions and 42.3% used preservative-free solutions.^{31,58} The Tear Film and Ocular Surface Society DEWS II, in the second step of management and treatment recommendations for dry eye, suggests the use of non-preserved ocular lubricants to minimize preservative induced toxicity.¹⁹ Patients with dry eye may be more vulnerable to preservative toxicity due to a reduced tear volume.⁵⁴

Eyelid Hygiene

Few studies are available on the effectiveness of eyelid hygiene in the treatment of dry eye disease. However, eyelid hygiene is generally recommended in dry eye disease associated with blepharitis to reduce the bacterial load on the eyelid margin.⁵⁹ It has been noted that about 20% of patients with Sjögren's syndrome have anterior blepharitis and 52% have bilateral meibomian gland dysfunction.⁵⁸ The bacterial components may include *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Propionibacterium acnes*, *Corynebacterium sp.*, and *Moraxella*.⁶⁰ Hypochlorous acid hygiene solution (0.01%) formed by polymorphonuclear neutrophils to kill microorganisms demonstrated to be effective against staphylococcus in biofilm without disrupting

biofilm structures.⁶¹ A recent study has confirmed that tea tree oil is effective against *Staphylococcus aureus* and the eradication of *demodex*.⁶⁰ Patients who used tea tree oil experienced improvements in Ocular Surface Disease Index and Tear Break Up Time. However, the use of tea tree oil and ivermectin caused irritation and may not be appropriate for all patients.⁶²

Even though eyelid hygiene therapy is commonly prescribed by practitioners, patient's compliance seems to be poor. A recent cross-sectional study involving patients with dry eye symptoms, detected that patients were moderately compliant; an improvement in symptoms were noted in patients who used eyelid hygiene.⁶³

Punctal Occlusion

Punctal occlusion is an obstruction of the tear drainage at the level of the canaliculus allowing tears, or tear substitutes, preservation on the ocular surface.⁵⁴ There are no large-scale studies demonstrating the efficacy of plug occlusion. Despite the theoretical blockage of tear drainage that may lead to an extended time of pro-inflammatory cytokines on the ocular surface, several reports strongly suggest the positive impact of punctal occlusion on dry eye signs and symptoms.^{19,54}

A study investigated the differences between two treatments, tear substitutes compared to punctal plugs over 3 months in 42 patients with primary Sjögren's syndrome and showed that in both groups there was a statistically significant improvement in Ocular Surface Disease Index, corneal fluorescein staining, Schirmer's, and Tear Break Up Time scores compared to baseline scores.⁶⁴ However, treatment of inflammation prior to punctal occlusion is essential.¹⁹

Prescription Medications

Topical Corticosteroids

Topical steroids have been shown to be beneficial in dry eye disease related to Sjögren's syndrome management.^{65,66} A study of 21 patients with primary and secondary Sjögren's syndrome treated with a non-preserved topical corticosteroid solution demonstrated a rapid and significant improvement in ocular irritation symptoms. There was also a decrease in corneal fluorescein scores and filamentary keratitis in all

patients with this condition. However, after more than 3 months of therapy, increased intraocular pressure and posterior subcapsular cataracts were evident.⁶⁵ Hong et al. treated 53 patients with Sjögren's syndrome with non-preserved 1% methylprednisolone solution for two weeks, then tapered off the therapy every two weeks until discontinuation. The authors found a significant decrease in fluorescein staining and improvement in Tear Break Up Time and Schirmer testing. They also observed an increase in periodic acid-Schiff-positive cells indicative of mucin secretory goblet cells. No complications were noted during the long-term treatment.⁶⁶

Topical Cyclosporine

Cyclosporine, an immunomodulatory drug that inhibits the release of proinflammatory cytokines, has shown to be effective in patients with Sjögren's syndrome.⁶⁷⁻⁷⁰ In a double-blind randomized control trial, 15 patients with secondary Sjögren's syndrome were treated with topical cyclosporine A 2% in olive oil and the other 15 patients received a placebo for two months. There was a significant increase in Tear Break Up Time and a reduction in rose bengal staining scores between the two groups.⁶⁸ A multicenter double-blind randomized control trial enrolled 877 patients with Sjögren's syndrome who instilled cyclosporine A at concentrations of 0.05% or 0.1% for six months. With either concentration of cyclosporin A, significant amelioration in corneal staining and Schirmer's testing was shown between the two groups. The improved corneal condition led to a significant improvement in the subjective measurements of blurred vision.⁶⁹ Another multicenter double-blind randomized control trial investigated 162 patients with and without Sjögren's syndrome using topical cyclosporine A at 0.05%, 0.1%, 0.2%, or 0.4% for 12 weeks and found a significantly improvement in rose bengal staining, superficial punctate keratitis, sandy or gritty sensation, dryness, itching and a decrease of Ocular Surface Disease Index scores. Cyclosporine A 0.1% presented the most consistent improvement in objective and subjective end points; cyclosporine A 0.05% gave the most consistent improvement in patient symptoms.⁷⁰

Lifitegrast

Lifitegrast is a small molecule lymphocyte function-associated antigen-1 antagonist that inhibits a specific T-cell inflammatory pathway involved in the pathogenesis of dry eye disease.⁷¹ Lymphocytic infiltrates of CD3⁺ T cells and CD4⁺ T-helper cells have been observed in conjunctival and lacrimal tissue in patients with and without Sjögren's syndrome.⁷²

Lifitegrast ophthalmic solution 5.0% has shown to be effective and safe in dry eye disease.^{73,74} Two studies have been conducted on patients with and without Sjögren's syndrome treated with Lifitegrast 5.0% or placebo.^{73,74} The first study of 718 subjects treated over 84 days reported a significant improvement from baseline in eye dryness scores and discomfort, but no significant improvement in inferior corneal staining.⁷³ A more recent study on 711 participants for 30 days showed that Lifitegrast-treated participants experienced significantly greater improvement from baseline in dry eye scores, itching, foreign-body sensation, and discomfort compared to those receiving a placebo treatment.⁷⁴

Autologous Serum

The use of autologous serum is indicated in severe dry eye disease, when previous treatments have not succeeded.¹⁹ Autologous serum contains fibronectin, vitamin A, cytokines, growth factors and anti-inflammatory substances, such as interleukin receptor antagonists and inhibitors of MMPs. Autologous serum has been described to be effective in patients with Sjögren's syndrome.^{75,76} Tsubota et al. showed a significant decrease in symptoms, fluorescein and rose bengal staining in Sjögren's syndrome after 4 weeks of 20% serum eye drops 6–10 times daily.⁷⁵ A study compared clinical efficacies of autologous serum in primary and secondary Sjögren's syndrome. After 4 weeks of treatment, patients with primary Sjögren's syndrome showed significant improvement in symptoms, ocular surface staining scores, and Tear Break Up Time while patients with secondary Sjögren's syndrome demonstrated no improvement.⁷⁶

CONCLUSIONS AND NEW FRONTIERS

The advent of SLs has extended their prescription and increased the number of conditions that may be

considered indications for their use. Their benefits have been widely documented, and related to dry eye disease they appeared consistent vis-à-vis comfort, visual function, and quality-of-life. Prescribing SLs when other treatments fail or in concurrence with other therapies may solve dramatic scenarios such as depression, anxiety, physical and mental fatigue and neuropsychiatric symptoms in patients with Sjögren's syndrome.

Although there have been numerous advances in our knowledge of Sjögren's syndrome, there are many potential areas of investigation. A variety of genetic and environmental risk factors as well as cellular and molecular pathways have been identified. This new knowledge may provide multiple targets for new systemic and ocular therapies. Additionally, technological advances have led to innovations in genetics, genomics and epigenetic research. An example is the characterization and analysis of DNA and RNA in patient samples on a genome-wide scale. These new techniques will help to identify additional risk factors for the diagnosis, treatment and management of Sjögren's syndrome.

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