Sjögren Syndrome: Oral Manifestations, Complications and Management

Fiona M. Collins, BDS, MBA, MA
Sjögren Syndrome: Oral Health Manifestations, Complications and Management

**ABSTRACT**

Sjögren syndrome is a chronic, inflammatory autoimmune disease with significant oral and systemic complications. Oral manifestations and complications of this disease include parched oral mucosa, discomfort, increased risk for caries and dental erosion, increased prevalence of candidal infections, and other conditions. A diagnosis of Sjögren syndrome may be suspected if dry mouth and dry eyes are both present, however a definitive diagnosis requires further investigation. Management of the oral complications of this syndrome requires palliative care/treatment of dry mouth and preventive care. Given the increased risk for oral diseases and non-Hodgkin's lymphoma, frequent recalls and therapy are required.

**EDUCATIONAL OBJECTIVES**

The overall goal of this article is to provide the reader with information on the management of the oral complications associated with Sjögren syndrome.

After completing this article, the reader will be able to:

• Describe classic signs and symptoms of Sjögren syndrome, and its prevalence;
• List and describe changes in salivary flow and composition;
• Review the oral complications of Sjögren syndrome; and,
• Review options for the management of oral complications associated with Sjögren syndrome.

Sjögren syndrome (SS) is named after Sir Henrik Sjögren, who recognized its symptoms of dry mouth, dry eyes and arthritis in some of his female patients.1

SS affects around 4 million people in the US alone, with a 9:1 ratio of females to males.2 Genetic, viral, neural, environmental and hormonal factors have all been attributed to this disease, and women with SS have been found to be androgen deficient.4 However, no definitive etiology has been found.3,5,6 Up to 90% of individuals with SS have antibodies targeting the Ro 60 and La autoantigens.7

Primary SS is a chronic inflammatory autoimmune disease affecting the salivary, lacrimal and other exocrine glands. Secondary SS also includes rheumatoid arthritis, systemic lupus erythematosus or another connective tissue disease.7 Disease progression involves lymphocyte-mediated glandular destruction, accompanied by autoantibody production,

**ABOUT THE AUTHOR**

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Dr. Fiona M. Collins has authored and presented CE courses to dental professionals and students in the United States and internationally, and has been an active author, editor, writer, speaker and trainer for several years. Fiona is a member of the American Dental Association, the ADA Standards Committee working groups, Chicago Dental Society, and the Organization for Safety, Asepsis and Prevention (OSAP). She is the ADA representative to AAMI and a Fellow of the Pierre Fauchard Academy. Dr. Collins earned her dental degree from Glasgow University and holds an MBA and MA from Boston University.

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connective tissue disorders and other clinical manifestations. SS results in severe salivary gland dysfunction and hyposalivation, impacting quality of life more than all other etiologies for dry mouth except head and neck radiation therapy.5,9

Patient Complaints

Patients report a variety of complaints. In a survey of 400 patients with SS, 98% experienced dry mouth and 93% dry eye.2 (Figure 1) Patients may complain of a sticky and/or dry feeling in the mouth, a sensation of pain or burning mouth/tongue, alterations in taste, stringy/ropey saliva, difficulty speaking, and a reduced ability to chew and swallow food. Patients may also complain of nocturnal discomfort, difficulty and discomfort wearing dentures, or an inability to tolerate spicy foods.10-15 Mucosal dryness is the chief oral complaint.16 Muscles, blood vessels, lungs and kidneys can also be affected, and SS causes vasculitis and peripheral neuropathy.3,17 Approximately 50% of patients are estimated to develop non-glandular signs and symptoms, and patients have a high risk of non-Hodgkin’s lymphoma with approximately 5% of patients affected.3,17 Patients have between 10 and 50 times the risk of developing lymphoma compared to the general population.18,19

Changes in Salivary Flow and Composition

Stimulated and unstimulated salivary flow rates of <0.1 ml/minute and <0.7 ml/minute, respectively, signify dry mouth;20,21 a 50% reduction in overall salivary flow is considered hyposalivation.22 The parotid supplies >50% of stimulated salivary flow. Sixty-five percent of unstimulated salivary flow is provided by the submandibular glands, the parotids supply 20% and the remainder is produced by the sublingual and minor salivary glands.23 Stimulated salivary flow accounts for approximately 80% to 90% of total saliva produced in a 24-hour period.23 Salivary flow also has a diurnal pattern, and is significantly lower at night (~0.1 ml/minute in a patient with normal salivary flow).23 Reduced salivary flow means reduced clearance of bacteria, fermentable carbohydrates and acids, reduced buffering capacity and reduced availability of agents that inhibit demineralization and promote remineralization, lubricate and moisturize, provide antimicrobial activity, and that aid digestion.23

The composition of saliva in SS is altered, leaving a thicker, stringy/ropey saliva. This results in difficulty eating, swallowing and speaking, and reduces oral lubrication and moisturization. Changes in cytokine expression and the levels of antimicrobial agents, enzymes and other agents are also found.7,24-27 In research on cytokine expression, patients with primary SS have been found to display lower levels of interleukin-1 beta (IL-1 ß),25 and elevated levels of IL-2 and salivary IL-6 compared to patients with secondary SS and those without SS.26 Increased levels of sodium have been observed,7 as well as for lactoferrin, lysozyme C, cystatin C and beta(2)-microglobulin,7 together with reduced levels of amylase and carbonic anhydrase.7 Other findings include reductions in the production of proteins, peroxidase activity, and secretory immunoglobulin A.27 (Figure 2) These changes collectively alter the levels of functional agents in saliva, further impacting the perception of taste (carbonic anhydrase (gustin)), protection of soft and hard tissues, and digestion.

Oral Manifestations

Patients present with dry and parched-looking soft tissues, erythematous oral mucosa, dry or cracked lips and a parched appearance to the tongue.12 (Figure 3) Retained food and debris may be present due to reduced salivary clearance; more
dental plaque may also be evident, although patients with SS generally have good oral hygiene. Progressive salivary gland enlargement is a classic manifestation (Figure 4); in some patients, it precedes hyposalivation and changes to the appearance of the oral mucosa. Salivary gland enlargement may be unilateral or bilateral. (Figure 4) It is important to assess salivary gland enlargement. Severe oral dryness can result in a mouth mirror sticking to the cheek, and a digit (gloved) may adhere to soft tissue during palpation. Patients also may experience halitosis, associated with methyl mercaptans produced by gram-negative bacteria.

An increased caries risk and caries experience are observed, and early loss of teeth may occur, associated with hyposalivation, reduced buffering capacity, and the reduced availability of calcium, phosphate, fluoride, and antibacterial agents. Caries lesions are typically found at cervical and incisal sites, cusp tips, and recurrent caries at cervical margins. Dental erosion may be evident, with progressive loss of tooth structure and may be followed by dentinal hypersensitivity once open dentinal tubules are exposed. Additionally, an estimated 30% of patients experience GERD, compounding the risk for erosion. Sucking on acidic candies or lemons to relieve dry mouth increases the risk of erosion, and candies with sugar increase caries risk. Sour candies appear to contain greater concentrations of acid, and to be more detrimental than other candies. An association may exist between SS and lichen planus (which has potential for malignant transformation), recurrent aphthous stomatitis, pemphigus vulgaris and mucous membrane pemphigoid.

### Periodontal Tissues

Some studies have found no significant differences in the periodontal status of patients with and without SS, while in others the converse has been observed. One study found a higher gingivitis index in patients with secondary SS (after adjusting for plaque present), and a higher mean clinical attachment loss (CAL) and probing depth (PD). In patients with similar periodontal disease parameters, significantly greater CAL (p<0.01) and greater levels of gingival crevicular fluid (p<0.001) have been observed in patients with SS (mean 8.8 years) compared to those with dry mouth with a different etiology.
Increased bleeding on probing has also been observed.\textsuperscript{36} Patients with SS (n=30) had better oral hygiene than others, yet even when plaque scores improved there was no decrease in bleeding, periodontal pockets or gingival hypertrophy. This lack of improvement correlated with high salivary levels of B-cell activating factor (BAFF) (p<0.002). It was proposed that the effect of B cells in periodontal disease was influenced by salivary BAFF.\textsuperscript{38}

**Oral Infections - Candidiasis**

Patients with SS may experience candidiasis, presenting as angular cheilitis, erythematous areas or white patches.\textsuperscript{12} The risk is greater for denture wearers, with candidiasis developing on the palate. Yeast forms were present in samples from oral rinsing and supra-gingival plaque in 72% of primary SS patients, 41% of secondary SS patients and 0% of patients without SS in one study (p<0.0001); more than 85% of the yeasts were Candida.\textsuperscript{39} In another study, Candida was present in the saliva of patients with SS.\textsuperscript{37} One study found candidiasis in 87% of patients with primary SS.\textsuperscript{40}

**Diagnosing Sjögren Syndrome**

SS may be suspected based on a history of dry eye and dry mouth. Changes in taste, ocular/throat dryness and a sensation of ‘burning mouth’ may also suggest SS. Stimulated salivary flow (after chewing on paraffin or wax), and unstimulated salivary flow, can be objectively measured by having the patient salivate and expectorate into a cup for five minutes for each test.\textsuperscript{41} However, there are many etiologies for hyposalivation, and the oral manifestations of SS are not unique.

A definitive diagnosis is made based on specific criteria and by a process of exclusion. The 2 main sets of standard criteria used are the European-American\textsuperscript{42} and the American College of Rheumatology Classification Criteria.\textsuperscript{43}

**European-American Criteria\textsuperscript{42}**

For a primary SS diagnosis:

1. A lip biopsy must show focal lymphocytic sialoadenitis (focus score ≥1 per 4 mm²) OR Anti-SSA (Ro), OR Anti-

<table>
<thead>
<tr>
<th>Table 1. Oral manifestations of Sjögren syndrome</th>
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<tr>
<td><strong>Dry, parched oral mucosa</strong></td>
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<tr>
<td><strong>Dry or cracked lips</strong></td>
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<td><strong>Retained food or debris</strong></td>
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<td><strong>Salivary gland enlargement</strong></td>
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<td><strong>Recurrent caries at cervical margins</strong></td>
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<tr>
<td><strong>Gingivitis and periodontal disease</strong></td>
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<tr>
<td><strong>Candidial infections</strong></td>
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More information on the criteria and secondary SS can be found in the document by Vitali et al.\textsuperscript{42}

SSB (La) antibodies (or both) must be present, AND,

2. 3 other of the total of 6 criteria must be present. (Table 2)

**American College of Rheumatology Classification Criteria\textsuperscript{43}**

Two of three of the following criteria must be met for a diagnosis of SS:

1. Positive serum anti-SSA and/or anti-SSB or [positive rheumatoid factor and ANA ≥1:320];
2. Ocular staining score ≥ 3;
3. Focal lymphocytic sialadenitis with a score ≥ 1 focus/4 mm² in labial salivary gland biopsies.\textsuperscript{43}

A review of both sets of criteria found substantial agreement in the results, with no evident advantage for either, leading to the conclusion that a better understanding of the disease was needed for diagnostic improvements.\textsuperscript{44}

<table>
<thead>
<tr>
<th>Table 2. Criteria for Sjögren syndrome</th>
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<tr>
<td><strong>Ocular Symptoms (at least one):</strong> Symptoms of dry eyes for at least 3 months; A foreign body sensation in the eyes; Use of artificial tears 3 or more times/day</td>
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<tr>
<td><strong>Oral Symptoms (at least one):</strong> Symptoms of dry mouth for at least 3 months; Recurrent or persistently swollen salivary glands; Need for liquids to swallow dry foods</td>
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<tr>
<td><strong>Ocular Signs (at least one):</strong> Abnormal Schirmer’s test, (without anesthesia; ≤5 mm/5 minutes); Positive vital dye staining of the eye surface</td>
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<tr>
<td><strong>Histopathology:</strong> Lip biopsy showing focal lymphocytic sialoadenitis (focus score ≥1/4 mm²)</td>
</tr>
<tr>
<td><strong>Oral Signs (at least one):</strong> Unstimulated whole salivary flow (≤1.5 ml in 15 minutes); Abnormal parotid sialography; Abnormal salivary scintigraphy</td>
</tr>
<tr>
<td><strong>Autoantibodies (at least one):</strong> Anti-SSA (Ro) or Anti-SSB (La), or both</td>
</tr>
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</table>
Salivary Diagnostics

A proteolytic peptide biomarker for SS has been discovered, using bioinformatics and high-resolution mass spectrometry on individual samples of unstimulated saliva from patients with and without SS. This peptide was consistently only present in patients with SS, and may have potential as a simpler way to diagnose this syndrome, without the need for invasive tests and the associated discomfort. A second potential biomarker, CXCL13, is a B-cell chemokine that is elevated from salivary glands and systemically in patients with SS. Early identification of patients prior to clinical manifestations may also become possible, based on findings of autoantibodies predictive of SS. Eighty-two percent of patients (n=117) with autoantibodies following diagnosis had these present up to 20 years earlier (median 4.3-5.1 years). Ro 60, Ro 52 and La are antigens that consist of RNA binding proteins, and autoantibodies target these. Anti-Ro/SSA and anti-La/SSB antibodies were predictive for primary SS. Anti-Ro 60/SSA and anti-Ro 52/SSA were most predictive, respectively 25% and 100%, especially for early-onset disease and disease severity.

Management of the Oral Complications of Sjögren Syndrome

Thorough oral hygiene, stimulation of saliva, palliative care and/or treatment to relieve dry mouth and its associated symptoms, and treatment to prevent and manage the other potential complications of dry mouth are required. Areas of focus include professional care, periodic recalls, oral hygiene, palliative care and treatment for dry mouth, and the prevention and treatment of dental caries, erosion, periodontal disease and (other) oral infections.

Professional Care

Regular extra- and intra-oral examinations and recalls are essential. Patients should be assessed for periodontal disease, dental erosion and dental caries at each recall appointment, and preventive and maintenance care provided and recommended. Advice should be provided to patients on beneficial home care and habits, and on what to avoid. Recall visits may be required more frequently than every 6 months to prevent, detect and manage oral disease. In addition, a thorough soft tissue examination is necessary, and care taken to check for signs of lymphoma given the increased risk level in patients with SS.

Oral Hygiene

Thorough oral hygiene is essential. Patients should be
advised to brush twice daily using a soft-bristled toothbrush and a fluoride toothpaste. Patients may find dry mouth toothpastes and lubricating gels that alleviate dry mouth and contain fluoride are helpful. These contain lubricating agents and do not contain sodium lauryl sulfate. Antibacterial toothpastes help to control plaque and gingivitis, and may also reduce halitosis. Daily interdental cleaning is also important. Rinsing with baking soda (water with 1 teaspoon of baking soda) helps to counteract bacterial and erosive acids, and to prevent demineralization, by increasing the intraoral pH. A chewable lozenge that contains bicarbonate as a buffering agent, calcium carbonate and arginine is also available (BasicBites, Ortek Therapeutics Inc.). Denture hygiene using a brush and denture cleansers will remove debris and microorganisms. Denture use at night should be discouraged. The selection of, and recommendations for, oral care products should be based on clinical efficacy, safety, and the needs and preferences of the individual patient.

Managing and Treating Dry Mouth
- **Saliva substitute sprays** (OTC) contain a thickening agent making them viscous to ‘moisturize’ the oral mucosa, and are portable. Xanthan gum and and mucin may provide better wetting and flow than carboxymethylcellulose in saliva substitutes, and may be preferred for patients with SS.
- **Dry mouth gels and rinses** (OTC) typically contain glycerine, hydroxyethylcellulose, or carboxymethylcellulose, as the moisturizing/lubricating agent; buffering agents (calcium bicarbonate); antibacterial agents; or, combinations of these. Moisturizing gels are thick, and their use at night is recommended as they adhere for long periods of time to the mucosa.
- **Supersaturated calcium phosphate rinses** (Rx) have been found in some studies to relieve dry mouth and to improve taste perception, ease of eating, drinking and swallowing. Originally, this type of rinse came as two vials containing solutions mixed immediately before use. An effervescent tablet version has now been developed (Caphasol, EUSA Pharma), and powder sachets that are mixed with water immediately before use are available (NeutraSal, Orapharma; SalivaMAX, Forward Science). In one study, patients with xerostomia reported an average rating of 9 (1 = ‘dry as a desert’ and 10 = normal), compared with an average score of 2 before using a supersaturated calcium phosphate rinse containing sodium bicarbonate for 28 days in one study (n=60; 30 control and 30 test). Functional improvements ranged from 80% for eating, 90% for swallowing and talking, and 93% for drinking. In the same study, the average salivary pH increased from 5.9 to 7.
- **A time-release mucoadhesive disc** with xylitol, that aids oral moisturization/lubrication is also available (XyliMelts, OraCoat) as well as a mucoadhesive patch (Oramoist, DenTek).
- **Dry mouth lozenges** that can be chewed or sucked to help moisturize oral mucosa and provide relief from dry mouth.
- **Applying vitamin E oil** directly to the mucosa (or from a capsule with a hole in it) is also recommended for relief, 2 or 3 times daily.

There is currently insufficient data to make specific evidence-based recommendations on interventions for the palliative relief of dry mouth. However, individual studies have demonstrated relief—in some cases without increasing salivation, including for patients with severe hyposalivation.

Sialogogues
Pilocarpine hydrochloride (Salagen; MGI Pharma) and cevimeline hydrochloride (Evoxac; Daiichi-Sankyo) are indicated for severe hyposalivation associated with SS. Both are cholinergic agents that stimulate salivary gland function. Pilocarpine is prescribed at a dose of 5 mg, four times daily for at least 12 weeks to provide clinical benefit and use must be ongoing to keep this benefit. Cevimeline is prescribed at a dose of 30 mg, 3 times daily. Both pilocarpine and cevimeline are clinically effective. Sialogogues have potentially serious side effects such as dizziness, alterations in vision and stomach upset and, rapid or slowed heart rate.

**Recommending Lifestyle Adjustments and Choices**
Patients should be advised to sip water frequently, and to suck sugar-free lozenges or small ice chips to relieve dry mouth. Eating softer foods, and sipping water frequently during meals, helps make chewing and swallowing food easier, and choosing favorite foods and flavors helps
stimulate saliva. Spicy foods may cause irritation and are not well-tolerated; general advice is to avoid these. Chewing sugar-free gum ad libitum helps to stimulate saliva between meals.88,69 Xylitol gum may help as part of a preventive program,70 and chewing gum with casein phosphopeptide-amorphous calcium phosphate is another option. Using a humidifier at home (and not a dehumidifier) may help, especially at night when salivary flow is lowest.48 If lips are dry, patients can apply a lip balm to relieve dryness.

Preventing and Controlling Oral Disease

The ADA recommendations for in-office preventive care for at-risk patients age 6 and over is application of 5% sodium fluoride varnish or 1.23% 4-minute APF gel at least every 3 or 6 months.71 Silver diamine fluoride is now also available in the US, and has been shown to be effective in arresting and preventing dental caries.72 These are off-label uses for both types of products. At-home use of a prescription-level fluoride once or twice daily increases protection against dental caries and is recommended for at-risk patients.73 Fluorides also help strengthen tooth structure against erosive acid challenges.74-76 Rinsing with an alcohol-free fluoride mouth rinse is of adjunctive benefit against caries, and has been recommended when the mouth feels dry or after eating/drinking;73 Alcohol-containing rinses should be avoided as these have a drying effect and can cause irritation.

Calcium phosphate products may also be recommended. In one study (n=134) daily use of prescription-level fluoride toothpaste, combined with up to 3 to 4 times daily use of supersaturated calcium and phosphate rinse, resulted in statistically significant reductions in coronal and root caries, and remineralization of existing caries lesions (p<0.0001) in patients with severe xerostomia.77 Paste containing fluoride and casein phosphopeptide-amorphous calcium phosphate may also be applied at night and left on the teeth, and provides a source of calcium, phosphate and fluoride.48,78 Pastes and gels containing calcium and phosphate, and amorphous calcium phosphate, are also available.

Table 3. Advice on reducing caries and erosion risk

<table>
<thead>
<tr>
<th>Advice for reducing caries and erosion risk</th>
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<tr>
<td>Rinse with water and one teaspoon to increase the intraoral pH after exposure to acids</td>
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<tr>
<td>Maintain a low-sugar diet</td>
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<tr>
<td>Avoid eating foods or drinking liquids containing sugar</td>
</tr>
<tr>
<td>Avoid sucking candies or chewing gum containing sugar</td>
</tr>
<tr>
<td>Avoid acidic foods, drinks, vegetables, fruits and chewing gum</td>
</tr>
<tr>
<td>Avoid acidic or sour candies</td>
</tr>
<tr>
<td>Avoid carbonated drinks and alcohol</td>
</tr>
<tr>
<td>Avoid caffeine and alcohol, which are both acidic and also exacerbate dry mouth</td>
</tr>
<tr>
<td>Avoid street drugs, which are also drying and detrimental to health</td>
</tr>
</tbody>
</table>

Advice should be given to patients to avoid foods, drinks and habits that increase the risk for dental caries and erosion. (Table 3) Based on recent data, patients should also be advised to avoid brushing for at least 1 hour after eating or drinking anything acidic (or after exposure to other extrinsic or intrinsic erosive acids), to reduce the risk of erosive tooth wear.79

Treating Oral Candidal Infections

Oral candidiasis can be treated with topical nystatin, often applied as a cream or ointment.80 Nystatin ointment can be applied in a thin layer 4 times daily for 14 days to treat intra-oral fungal infections as well as to the commissures of the lip to treat candidal angular cheilitis.81 Nystatin and chlorhexidine gluconate rinse should not be used together because they counteract each other.82 While nystatin rinse is also available for the treatment of widespread intra-oral candidal infection, this contains sucrose and would increase the already-elevated risk of dental caries in this patient population.81 Other options include nystatin pastilles, amphotericin lozenges and miconazole gel. Nausea, vomiting and diarrhea are side effects of nystatin and miconazole.81,83 If a denture wearer is experiencing candidiasis, he/she can be advised to clean the denture, leave it out at night and soak it in chlorhexidine gluconate rinse.81 Probiotics have also been suggested as a potential treatment for the reduction and treatment of oral candidiasis.84
**Tobacco Cessation**

Smoking tobacco exacerabtes dry mouth, increases the risk for periodontal disease and with more severe and rapid progression. In addition, it is the greatest risk factor for oral cancer. Recent studies also indicate a role in dental caries and autoimmune diseases. Patients who use tobacco should be advised to stop and be given advice on how to quit and/or a referral.

**Emerging and Potential Treatments for Patients with SS**

Novel treatments being investigated and/or already in use include acupuncture, electrical nerve stimulation, and extra-oral and intra-oral reservoir hydration devices including in full dentures. Overall, there is currently insufficient evidence on the efficacy of electrostimulation devices in relieving the discomfort associated with dry mouth, and low evidence on the effects of acupuncture. While most care for dry mouth is palliative, treatment with interferon (IFN) holds promise for SS sufferers; interferon increased whole saliva by 16.8% in one study, believed to be the result of inhibition of IL-2 and IL-6, and increased salivary flow. IFN-alpha lozenges may enhance saliva flow in primary SS patients. In the future, stem cell therapy may hold promise as an option to help restore salivary flow. Potential therapies for the future include the development of artificial salivary glands.

**Conclusions**

Sjögren syndrome significantly impacts oral and systemic health. Oral manifestations of this disease include parched oral mucosa, discomfort, increased risk for caries and erosion, increased prevalence of candida infections, and other conditions. Patients also are at greater risk than the general population for non-Hodgkin’s lymphoma. Frequent recalls and care are required for patients with SS. Management of the oral complications of this syndrome requires palliative care/treatment of dry mouth, preventive care and maintenance. In addition, patients should be given advice on home care and habits, and on behaviors to avoid. Novel and potential future treatments for palliative and preventive care, including the use of preventive agents and rinses, holds promise for the management of this disease. Finally, by testing genetically and using biomarkers in the future, it may be possible to screen and identify at-risk individuals sooner and to provide earlier intervention.

**References**

Available at: www.sjogrens.org.


Webbiography


   a. 2 million  
   b. 3 million  
   c. 4 million  
   d. 5 million

2. The most frequent complaints in patients with Sjögren Syndrome are ________.
   a. dry mouth and candidiasis  
   b. dry mouth and dry eye  
   c. dry eye and swelling  
   d. dry mouth and a hoarse voice

3. In patients with Sjögren Syndrome, saliva is ________.
   a. thin  
   b. stringy/ropey  
   c. yellow  
   d. highly basic

4. Progressive salivary gland enlargement is a classic manifestation of Sjögren Syndrome.
   a. True  
   b. False

5. Changes in ________ are found in the saliva of patients with Sjögren Syndrome.
   a. cytokine expression  
   b. the levels of antimicrobial agents  
   c. the amount of enzymes and other agents  
   d. all of the above

6. Sucking on acidic candies or lemons to relieve dry mouth increases the risk of ________.
   a. candida infections  
   b. viral infections  
   c. erosion  
   d. caries

7. Patients with Sjögren Syndrome may experience candidiasis, which always present as white patches.
   a. True  
   b. False

8. It was found in one study that 82% of patients with autoantibodies following diagnosis had these present up to ________ years earlier.
   a. 10  
   b. 15  
   c. 20  
   d. 25

9. A thorough soft tissue examination is necessary, and care must be taken to check for signs of ________ given the increased risk level in patients with Sjögren Syndrome.
   a. squamous cell carcinoma  
   b. lymphoma  
   c. pemphigoid manifestations  
   d. nicotinic stomatitis

10. The selection of, and recommendations for, oral care products should be based on ________.
    a. clinical efficacy  
    b. safety  
    c. patient needs and preferences  
    d. all of the above
11. Dry mouth gels and rinses (OTC) typically contain __________.
   a. a moisturizing/lubricating agent
   b. buffering agents
   c. antibacterial agents
   d. combinations of moisturizing/lubricating, buffering and antibacterial agents

12. Supersaturated calcium phosphate rinses (Rx) have been found in some studies to __________.
   a. relieve dry mouth and improve taste perception and ease of eating
   b. reduce oral aphthae
   c. substantially increase salivation
   d. a and c

13. A __________ is an option for the relief of dry mouth.
   a. spray saliva substitute
   b. dry mouth lozenge
   c. saliva-stimulating oral disc or patch
   d. all of the above

14. Patients should be advised to avoid __________.
   a. bland foods
   b. candies, foods and drinks that contain sugar and/or are acidic
   c. nonalcoholic drinks
   d. chewing gums

15. __________ are recommended for patients with Sjögren syndrome to help protect tooth structure.
   a. Fluoride varnish and home-use fluorides
   b. Antimicrobial varnishes
   c. Hydrogen peroxide rinses
   d. Occlusal splints

16. If a denture wearer is experiencing candidiasis, he/she can be advised to clean the denture and to __________.
   a. coat it before wearing it
   b. leave it out at night and soak it in chlorhexidine gluconate rinse
   c. leave it out 4 times a day for 30 minutes and to soak it in peroxide
   d. any of the above

17. Patients who use tobacco should be advised to stop, and be given advice on how to quit or given a referral.
   a. True
   b. False

18. In one study on interferon, this was found to increase whole saliva by __________, believed to be the result of inhibition of IL-2 and IL-6.
   a. 14%
   b. 15.8%
   c. 16%
   d. 16.8%

19. Overall, there is currently __________ evidence on the efficacy of electrostimulation devices in relieving the discomfort associated with dry mouth, and __________ evidence on the effects of acupuncture.
   a. sufficient; low
   b. insufficient; good
   c. insufficient; low
   d. sufficient; good

20. In the future, by using biomarkers and genetic testing, it may be possible to screen and identify at-risk individuals sooner and to provide earlier intervention.
   a. True
   b. False
Please evaluate this course using a scale of 3 to 1, where 3 is excellent and 1 is poor.

1. Clarity of objectives ..................................... 3 2 1
2. Usefulness of content .................................... 3 2 1
3. Benefit to your clinical practice ....................... 3 2 1
4. Usefulness of the references ............................ 3 2 1
5. Quality of written presentation .......................... 3 2 1
6. Quality of illustrations .................................... 3 2 1
7. Clarity of quiz questions ................................. 3 2 1
8. Relevance of quiz questions ............................. 3 2 1
9. Rate your overall satisfaction with this course ........ 3 2 1
10. Did this lesson achieve its educational objectives?  Yes  No
11. Are there any other topics you would like to see presented in the future?

COURSE EVALUATION

Please evaluate this course using a scale of 3 to 1, where 3 is excellent and 1 is poor.

1. Clarity of objectives ..................................... 3 2 1
2. Usefulness of content .................................... 3 2 1
3. Benefit to your clinical practice ....................... 3 2 1
4. Usefulness of the references ............................ 3 2 1
5. Quality of written presentation .......................... 3 2 1
6. Quality of illustrations .................................... 3 2 1
7. Clarity of quiz questions ................................. 3 2 1
8. Relevance of quiz questions ............................. 3 2 1
9. Rate your overall satisfaction with this course ........ 3 2 1
10. Did this lesson achieve its educational objectives?  Yes  No
11. Are there any other topics you would like to see presented in the future?

EDUCATIONAL OBJECTIVES

1. Describe classic signs and symptoms of Sjögren syndrome, and its prevalence;
2. List and describe changes in salivary flow and composition;
3. Review the oral complications of Sjögren syndrome; and,
4. Review options for the management of oral complications associated with Sjögren syndrome.

COURSE SUBMISSION:

1. Read the entire course.
2. Complete this entire answer sheet in either pen or pencil.
3. Mark only one answer for each question.
4. Mail answer form or fax to 732-303-0555.

For immediate results:

1. Read the entire course.
2. Go to www.dentallearning.net/DUW-ce.
3. Log in to your account or register to create an account.
4. Complete course and submit for grading to receive your CE verification certificate.

A score of 70% will earn your credits.

If you have any questions, please email Dental Learning at questions@dentallearning.net or call 888-724-5230.

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