Quality Resource Guide

Xerostomia Revisted

Author Acknowledgements

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The following commentary highlights fundamental and commonly accepted practices on the subject matter. The information is intended as a general overview and is for educational purposes only. This information does not constitute legal advice, which can only be provided by an attorney.

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The content of this Guide is subject to change as new scientific information becomes available.

Educational Objectives

Following this unit of instruction, the learner should be able to:

1. Recognize the functions of saliva in maintaining oral health.
2. Recognize the prevalence and causes of xerostomia in the population.
3. Recognize the signs and symptoms of xerostomia.
4. Enable patients to manage the symptoms of xerostomia.
4. Prevent and treat the complications of xerostomia.

Preface

This purpose of this update is to provide our readers with a summary of current knowledge of xerostomia and additional information that has not been previously provided.

It is expected that this update contain “evidence based” recommendations for the practitioner as determined from the latest research and studies of clinical outcomes. There is, however, little evidence that supports the efficacy of current therapies for the management of xerostomia. Over-the-counter (OTC) saliva substitutes are still the predominant agents available for the relief of the symptoms of dry mouth, and innovative therapies for the generation of saliva are being evaluated but are not yet available.

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Salivary Gland Hypofunction

Definitively establishing salivary gland hypofunction should be based on sialometry which measures the amount of saliva that can be collected within a specified period of time. Salivary secretions may be *stimulated* by chewing a piece of paraffin, or by measuring *unstimulated* (resting) saliva that is allowed to pool in the mouth. *Hypofunction* is defined as the production of less than 0.12 - 0.16 mL/minute if stimulated, or ≤1.5 mL/15 minutes if unstimulated. Measurements of salivary output, however, are subject to considerable variation and may have to be repeated. This can be time-consuming, expensive, and provides no particular benefit for the patient since "normal" or "abnormal" amounts of saliva may not coincide with patients' perceptions or level of discomfort from having a dry mouth. It has also been suggested that salivary flow must be reduced by 50% before symptoms of dry mouth develop, but this has not been substantiated. Irrespective of these features, the clinician can determine if salivary gland hypofunction has developed based on clinical changes in the oral cavity that are described below.

Xerostomia

Xerostomia has been defined as a subjective, self-reported patient complaint of having a "dry mouth." This can be confirmed by administering a questionnaire to patients and their responses to having at least one or more symptoms related to dry mouth (Fox criteria)[1] :

- Does your mouth usually feel dry?
- Does your mouth feel dry while eating a meal?
- Do you have difficulties swallowing (dry) foods?
- Is the amount of saliva in your mouth too little most of the time or don't you notice it?

Another xerostomia questionnaire that is based on one question has also been found to be a reliable indicator for determining the presence of xerostomia secondary to hyposalivation: *"How often does your mouth feel dry? Never? Occasionally? Frequently? Always?"* A response of "always" was indicative of xerostomia.

There is a trend to use "xerostomia" more inclusively as being indicative of either having symptoms of dry mouth or having clinical manifestations of hyposalivation. This may be a reflection of the variability and inconsistency of patient descriptions of their symptoms. Patients may complain of dryness irrespective of the amount of saliva in the mouth, and conversely, patients with clinical manifestations of hyposalivation may not perceive having a dry mouth. In this regard, it should be reemphasized that patient symptoms or perceptions may not be reliable measures of xerostomia or salivary gland hypofunction. This may be related, in part, to the fact that saliva is composed of secretions from both the major and minor salivary glands. These secretions differ in their composition, particularly their water and mucin content that may result in varying perceptions or sensations of "wetness" or "dryness."[2] It is also likely that function of the major and minor salivary glands are variably affected by the numerous causes of hyposalivation.

Prevalence of the Major Causes/Etiologies of Xerostomia

1. Use of xerogenic medications. This is based on the large number and various classes of these medications that are available OTC or by prescription (**Table 1**). Use of xerogenic medications is compounded by polypharmacy for the treatment of more common chronic conditions such as hypertension, cardiovascular disease, diabetes, emphysema, and asthma, particularly in the increasing number of elderly in the population. Additionally, multiple psychotropic drugs for mood disorders, opioid analgesics, and agents that affect neurotransmission are being used for the management of chronic pain that has been estimated to affect 100 million people[3] and continues to be a major health concern in the U.S. It should be noted that patients often have more than one concurrent medical condition or ailment for which they may be taking several prescription as well as OTC xerogenic medications. It has

Table 1 - Therapeutic Categories of Drugs That May Reduce Saliva

Anorexiants	Tenuate®
Antianxiety agents	Xanax®, Ativan®, Librium®
Antispasmodic/anticholinergic agents	Cogentin®, Detrol®
Anticonvulsants	Tegretol®, Neurontin®
Antidepressants	Prozac, Trazodone®, Wellbutrin®
Antiemetics	Dramamine®, Antivert®
Antihistamines	Dimetane®, Claritin®
Antihypertensives	Catapres®, Vasotec®
Antiinflammatory analgesics	Advil®, Naprosyn®
Antineoplastic agents	Myleran®, Roferon®-A
Antiparkinsonian agents	Sinemet®
Antipsychotics	Thorazine®, Compazine®
Bronchodilators	Atrovent®, Albuteral®
Decongestants	Sudafed®, Advair®
Diuretics	Diuril®, Lasix®, Dyazide®
Muscle relaxants	Flexeril®, Norflex®
Narcotic analgesics	Vicodin®, Percocet®
Sedative hypnotics	Valium®, Ambien®

been shown that among patients taking one to more than seven medications, the prevalence of xerostomia increased from 17% to 67%, respectively. Furthermore, many medical conditions are chronic that will require continuous use of the medication resulting in long-term exposure to the drug's xerogenic side effects.

In addition to xerogenic prescription medications, innumerable products are available OTC which also have the potential for reducing salivary function. These include antihistamines, decongestants, and preparations for gastrointestinal ailments such as reflux (**Table 1**). The therapeutic categories and examples of drugs that have been reported to cause xerostomia in 1% to 10% of patients are summarized in **Table 1**.[4]

2. Secondary Sjögren Syndrome. This is a complication has been associated with several not uncommon concurrent diseases listed in **Table 2**. It is estimated that 30% of patients with systemic lupus erythematosus, 25% with systemic sclerosis, and 15% with rheumatoid arthritis become xerostomic due to the development of secondary Sjögren Syndrome.

3. Xerostomia associated with diabetes mellitus. The Centers for Disease Control and Prevention (CDC) estimate that 30 million people in the U.S. have diabetes. This, in conjunction with its complication, renal failure that may subsequently require dialysis contributes to xerostomia (**Table 2**).

4. Xerostomia secondary to radiation therapy for cancers of the oral cavity and oropharynx and the use of radioactive iodine (131^{I}) for thyroid cancer.

5. The last four medical conditions listed in Table 2 have variably been associated with xerostomia.

6. The prevalence of **primary Sjögren Syndrome** is estimated to be <1% of the population and is more common in post-menopausal women than men (9:1).

NOTE: Sjögren Syndrome has become the preferred terminology as opposed to the traditional Sjögren's Syndrome.

Table 2 - Diseases Associated with Xerostomia

- Primary Sjögren's Syndrome
- Sjögren's Syndrome (secondary), in conjunction with:
  - Rheumatoid arthritis
  - Systemic lupus erythematosus
  - Systemic sclerosis (scleroderma)
  - Fibromyalgia
  - Chronic fatigue syndrome
  - Primary biliary cirrhosis
  - Hepatitis C
  - Autoimmune hepatitis
- Diabetes mellitus
- Renal failure; renal dialysis
- HIV infection or AIDS
- Sarcoidosis
- Graft-versus-host disease
- Sleep apnea

Radiation

Radiation therapy is used as the primary or adjuvant treatment modality with chemotherapy for squamous cell carcinomas in the oral cavity or oropharynx. The incidence of squamous cell cancers involving structures, particularly in the oropharynx, has been increasing as a consequence of infection with the human papilloma virus. If the area to be irradiated encompasses or is in proximity to the parotid or submandibular salivary glands, permanent damage to the glands can occur and result in a loss of saliva. A previous Quality Resource Guide titled, *Management of the Oral Complications Associated with Cancer Therapy* has addressed the salient issues of xerostomia in patients with cancers in the head and neck. In an effort to reduce the risk of xerostomic complications, radiation oncologists are implementing a number of techniques to protect or at least limit the degree of damage to the major salivary glands. The administration of Amifostine (Ethyol®) prior to each dose of radiation therapy has been shown to reduce the incidence of post-radiation xerostomia by approximately 25%.

Scientists at the National Institute of Dental and Craniofacial Research (NIDCR) have been developing and are currently testing gene transfer technology that could be used to regenerate radiation-damaged salivary glands.

Another source of radiation exposure is from radioactive iodine (131^{I}) that is used to treat thyroid cancer. Cancer of the thyroid gland is more prevalent in women and more than 50,000 new cases have been occurring annually. Radioactive iodine has an affinity for accumulating in the parotid glands. As a result, some of these patients can develop a significant degree of hypofunction that may be permanent.

Saliva consists primarily of water that continuously irrigates, lubricates, and physically cleanses the oral structures. The flow of saliva clears food debris and its degradation products, including bacteria, from the surfaces of the teeth. Bicarbonates, phosphates and proteins in saliva function as buffering agents against acids that are ingested or generated by bacterial fermentation of simple carbohydrates. In addition, the electrolytes calcium and phosphate not only prevent dissolution of enamel but also promote remineralization. Consequently, following radiation therapy, the loss saliva with these critical constituents and their physiologic functions can lead to significant dental complications that will be discussed below.

Recognition

Salivary secretions from the submandibular, sublingual and minor salivary glands contain high levels of mucins that lubricate and contribute to the "moistness" of the oral mucous membranes.[2] As a result, xerostomia may lead to a variety of oral manifestations (**Table 3**). One common sign is erythema of the tongue, with loss of papillae and increased fissuring (**Figure 1**). The oral mucous membranes may appear parched, and rubbing a finger or mouth mirror over their surfaces may result in their sticking to rather than sliding over the tissues. The saliva may appear "frothy" or "stringy" (**Figure 1**), and it may not be possible to elicit secretions from the parotid or submandibular gland duct orifices.

Patients may describe symptoms consistent with the Fox criteria[1] (above) that include a feeling of oral dryness, burning sensations in the mouth or tongue, lack of saliva or dryness particularly while eating dry foods or difficulty with swallowing (**Table 3**).

Table 3 - Manifestations of Xerostomia

SYMPTOMS

Complaint of dry mouth

Increased need to keep mouth moist

Difficulty with eating, swallowing or speaking

Dry mouth during the night

Loss of taste

Sensations of burning, tingling or soreness

Bad breath

SIGNS

Loss of lingual papillae, fissured tongue

Frothy, stringy saliva

Erythema of the oral mucosa

Accumulation of plaque

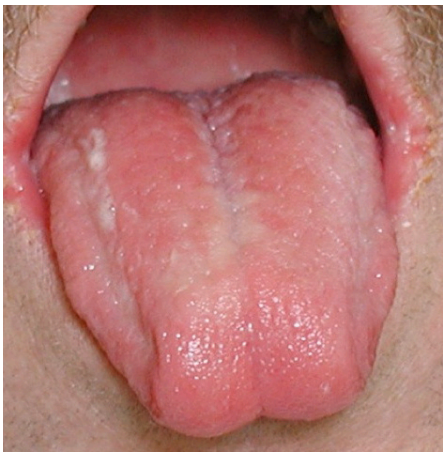
Gingivitis, bleeding

Evidence of candidiasis

Cervical decalcifications

Cervical caries

Figure 1



This xerostomic patient exhibits an inflamed and fissured tongue with atrophy of the filiform papillae and frothy saliva. There is also angular cheilitis secondary to candidiasis.

They may also report a need to sip or drink liquids while eating and problems with speaking. Since less saliva is normally produced at night, awakening at night and experiencing a dry mouth may be another manifestation. Saliva is also required to mediate the perception of taste that may lead to a loss of or altered taste. A perception of malodour (bad breath) has also been described.

Colonization by the fungus Candida albicans is more likely to develop in xerostomic patients. Extraorally, this can manifest as angular cheilitis (**Figure 1**). Within the oral cavity, candidiasis appears as erythematous, inflamed mucosa. It can also appear as dense, raised white plaques with erythematous borders. The hard and soft palate are often the first sites to be affected. On the tongue the infection may appear as a well-defined area of atrophy of the keratinized filiform papillae that is usually confined to the midline of the dorsal surface (median rhomboid glossitis) (**Figure 1**). Xerostomic patients are at even greater risk for developing oral candidiasis if they smoke, use dentures, have diabetes, or are taking antibiotics or medications with immunosuppressant properties such as corticosteroids. Inhalers for asthma or chronic obstructive pulmonary disease (COPD) not only contain bronchodilators that can cause dry mouth, but may be combined with a corticosteroid that will increase the risk for developing candidiasis. This is evident in the patient shown in **Figure 1**.

Patients with xerostomia are at greater risk for acute infections of the salivary glands (sialadenitis), and may be more susceptible to develop obstructions in the ducts of the parotid and submandibular glands.

Lack of saliva is likely to result in an increased accumulation of supragingival dental plaque, leading to gingivitis, which is often accompanied by bleeding with brushing or flossing.

Diagnosis of Xerostomia

A decrease in the production of saliva may be determined by a number of diagnostic tests. These include sialometry (described above) which uses saliva collection devices to collect and measure the amount of saliva that is secreted within a specified period of time. Imaging techniques such as radionuclide scintigraphy can also assess salivary gland function. Other technologies, such as magnetic resonance sialography, computerized tomography, and ultrasonography can identify structural and intrinsic abnormalities of the glands. Documentation of a reduction in salivary gland function by specialized studies, however, may be time consuming and costly. Furthermore, the results of these tests may not be of additional value for either the diagnosis or management of patients who have developed xerostomia or definitive manifestations of hyposalivation.

A diagnosis of primary or secondary Sjögren syndrome can be based on a number of features that include a predilection for occurrence in post-menopausal women, bilateral enlargement of the major salivary glands, and lack of production of saliva and tears (keratoconjunctivitis sicca). Patients may also demonstrate the presence of autoantibodies, a positive rheumatoid factor, or an elevated antinuclear antibody titer. A biopsy from the lower lip may reveal a chronic inflammatory cell infiltrate consisting primarily of lymphocytes and plasma cells that involves the minor salivary glands.

Irrespective of the results of laboratory tests or other special studies, however, the practitioner should be able to determine whether or not a reduction or loss of saliva has occurred based on: (1) a patient history of use of xerogenic medications, (2) clinical manifestations of xerostomic changes in the oral cavity whether or not they are accompanied by symptoms of xerostomia, (3) the presence of concurrent systemic conditions that have been associated with xerostomia or secondary Sjögren syndrome, and (4) clinical and pathophysiological abnormalities associated with primary and secondary Sjögren syndrome.

Treatment of Xerostomia

Patients' physicians should be consulted to determine if their medication(s) can be substituted with alternate classes of the drugs that have less xerogenic side effect(s) or if the dose can be reduced. Taking medication(s) in divided doses and not taking them before bedtime may provide additional benefits since the production of saliva is diurnal and less is secreted at night.

A large number of remedies have been developed for replacing saliva and alleviating the discomfort associated with xerostomia and are summarized in **Table 4**. These are formulated to function as saliva substitutes and also to replicate some of the constituents in natural saliva. Although available OTC, these moistening agents may have a limited duration of action that may require frequent re-administration and consequently are not cost-effective. Some newer products, however, have been developed that provide longer intervals of efficacy. These are available as oral solutions, aerosols, sprays, gels, lozenges or troches (**Table 4**). The relative efficacy of these remedies, however, could not be determined based on an extensive systematic review of multiple studies that have evaluated various xerostomic therapies. That review found no evidence that any of the currently available agents were more effective in alleviating xerostomia. Furthermore, these products contain similar ingredients that would contribute to the difficultly with distinguishing among them for their efficacy. In addition, the inherent variability of patient perceptions and their thresholds for discomfort from xerostomia, irrespective of the degree of their hyposalivation, is affected by the differences in salivary secretions from the major and minor salivary glands as previously described. Various flavoring agents in these saliva substitutes, in conjunction with taste preferences and altered taste perception secondary to xerostomia may be additional confounders in the assessment of these palliative agents. Based on these variables, it is unlikely that evidence-based outcomes could determine the relative efficacy of saliva substitutes that are currently available.

There is some evidence that chewing sugar-free gum and use of lozenges may stimulate salivary flow, but this can only be effective if the patient has residual and functional salivary gland tissue with some natural salivary flow.

Two pharmacologic agents, pilocarpine and cevimeline (**Table 4**) can stimulate salivary secretions provided that the patient has residual and functional glandular tissue. Since these drugs require systemic administration in order to stimulate the cholinergic receptors of the salivary glands,

Table 4 - Products and Preventive Strategies for Xerostomic Patients

Salivary Stimulants
- Prescription Pharmacologic Agents
  - Pilocarpine (Salagen®)
  - Cevimeline (Evoxac®)
- Prescription Electrostimulation Devices (GenNarino Saliwell Ltd™)
- Over-the-Counter Electrostimulation Devices (Saliwell™)

Over-the-Counter Moisturizing Saliva Substitutes
- Biotene Oral Balance® Moisturizing Products
- Biotene Dry Mouth Moisturizing® Spray
- TheraBreath Dry Mounth® Oral Rinse

Lozenges and Patches
- OraMoist® Patches
- Optimoist Oral Moisturizer-Colgate Oral®
- TheraBreath Dry Mouth ® Lozenges
- ACT Total Care Dry® Mouth Lozenges

Xylitol-containing Lozenges
- Oracoat Xylimelts®
- ACT Dry Mouth Lozenges®

Xylitol Sprays
- Allday 100% Xylitol Dry Mouth Spray®
- Spry Xylitol Moisturizing Mouth Spray®

Xylitol-containing Candies/Mints
- PRO-SYS Xylitol Lollipops®
- Spry Xylitol Mints®
- Dr. John's Inspired Spray®
- Sweets Sugar Free®
- 3M ESPE TheraMints 100% Xylitol®

Xylitol-containing Chewing Gums
- Epic Dental 100% Xylitol Gum®
- PUR Gum Aspartame Free®
- XyliChew Soft Chewing Gum®
- Spry Xylitol Gum®
- Mighteaflow® chewing gum
- Ice Cubes from Ice Breakers® (not 100% xylitol)

Alcohol-free mouth rinses
- Listerine Total Care Zero Anticavity Mouthwash®
- Crest Pro-Health Multi-Protection Refreshing Mouthwash®
- Biotene Dry Mouth Oral Rinse®
- Biotene Dry Mouth Gentle Oral Rinse®

Candidal Infections
- Mycostatin® oral suspension
- Mycostatin®pastilles
- Mycelex® troches
- PerioGard®, Peridex® alcohol-free oral rinse

they can cause a variety of uncomfortable or intolerable side effects such as flushing, sweating, rhinitis, abdominal cramping, nausea, vomiting, and increased frequency of urination. It may be advisable to consult with the patient's physician before prescribing these drugs because of potentially medically significant systemic effects including dizziness and blurred vision. Furthermore, they are contraindicated in patients with narrow angle glaucoma or a history of cardiovascular disease, particularly cardiac arrhythmias.

Saliva electrostimulation devices are available OTC for extraoral or intraoral use. One intraoral device that is designed to stimulate the lingual nerve was found to be effective in increasing salivary flow and reducing xerostomic symptoms among patients with Sjögren syndrome and other causes of xerostomia. A similar device, by prescription, can be embedded in prostheses, but both types can only be effective if the patient has residual salivary gland function.

In summary, keeping the mouth moist appears to be the optimal, most effective strategy for palliation of the discomfort and accompanying functional difficulties of xerostomia. This can be accomplished by:

- Carrying a water bottle everywhere and taking small sips as needed
- Sucking on ice chips
- Taking sips of water or a sugar-free beverage with meals and when eating dry foods
- Using a humidifier at night

A non-foaming (non-detergent) dentifrice that does not contain sodium lauryl sulfate is recommended for xerostomic patients, since this ingredient, contained in most dentifrices, can have a deleterious effect on the protective mucin layer of the oral mucosa that may also be compromised in these patients.

Although a reduction in or loss of saliva can result in varying degrees of discomfort, it does not appear that hyposalivation has significant adverse effects on the oral soft tissues with the exception of a greater risk for the development of candidiasis. Several antifungal agents are available for the treatment of candidal infections (**Table 4**). These should be used for at least two weeks for the infection to totally resolve. Alcohol-free chlorhexidine gluconate-containing mouth wash (Peridex®), if tolerated, can be used to prevent recurrent infections in more susceptible patients. Keeping the mouth moist and use of any of the agents listed in **Table 4** may also reduce the risk of reinfection.

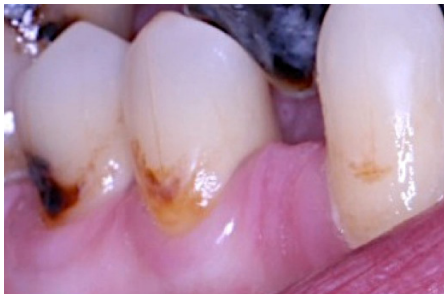
Dental Caries

Loss of saliva, in conjunction with its caries-protective electrolytes calcium and phosphate, buffering proteins, and antimicrobial enzymes can result in an increased susceptibility to the development of dental caries which can be devastating and irreversible. This can be compounded if patients initially resort to frequent use of sugar-containing candies, lozenges, or similar products in an effort to stimulate saliva and keep the mouth moist. The ingestion of fermentable carbohydrates creates an environment that increases the cariogenic oral flora in conjunction with a reduced capacity to recalcify dental enamel. A preference for carbonated soft drinks, fruit juices, as well as sports drinks can have an additive effect on caries susceptibility. Initially, areas of demineralization at the cervical areas develop that can progress (**Figures 2, 3**) and subsequently extend to the interproximal surfaces (**Figure 4**).

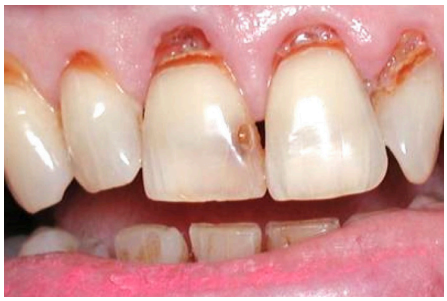
Xerostomia following radiation therapy to the head and neck places patients at greatest risk for developing a particularly aggressive form of "radiation caries" that has been reported to begin within weeks after initiation of the radiation therapy.

Irrespective of the cause of xerostomia, ongoing dental care must be provided with an emphasis on the prevention of dental caries. The practitioner can provide guidance and monitor the patient, but patients must comply with and adhere to a meticulous oral hygiene regimen. This can be augmented with a power toothbrush and other oral physiotherapy aids. It is essential that patients continuously apply fluoride-containing dentifrices augmented with OTC or higher concentrations of prescription mouth rinses, chewable tablets, or gel applications with custom tray carriers, if necessary that are required for the prevention of the initial demineralization

Figures 2 & 3

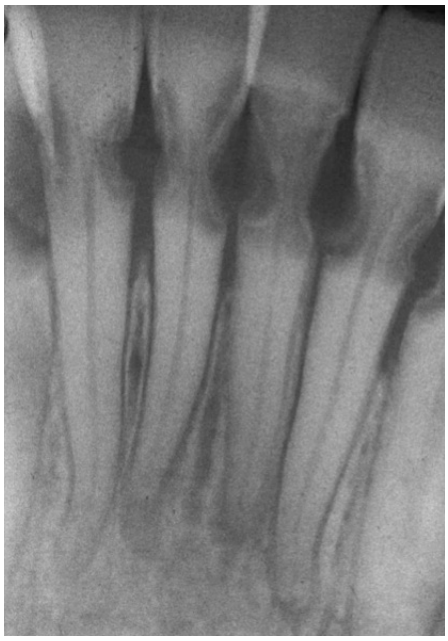


Cervical decalcification with progression to dental caries in a xerostomic patient.



An elderly patient with xerostomia-related cervical caries involving multiple teeth.

Figure 4



A radiograph of a xerostomic patient with advanced rampant cervical and interproximal caries.

process (**Figure 2**) (**Table 5**). Fluoride applications have also been shown to be effective for gingival recession and enhancing remineralization of root surface caries. Carious lesions can be restored with glass ionomer materials that provide ongoing fluoride release to the teeth.

Recall visits at shorter intervals should be encouraged in order to monitor compliance with home care, promptly identify areas of demineralization, and restore early carious lesions. Office visits should include a prophylaxis and application of a fluoride varnish. Dietary counseling should be reinforced with emphasis on avoiding foods and beverages that contain fermentable carbohydrates and "hidden sugars." Between meal snacks should be discouraged or limited to non-cariogenic products.

Increased susceptibility to dental caries places xerostomic patients at greater risk for tooth loss, and dental implants appear to be the preferred replacements over other fixed or removable prostheses. Studies of relatively small numbers of xerostomic patients have determined that there is no evidence that a lack of saliva adversely affects the integrity of dental implants including osseointegration and implant survival. Dental implants have also been successful in patients with Sjögren syndrome. and those who have had radiation therapy.

Reduced saliva contributes to plaque retention resulting in gingivitis. This can lead to gingival recession with exposure of the root surfaces. As a consequence, xerostomic patients become more susceptible to the development of root caries (**Figure 3**). In spite of these multiple adverse consequences, there is no definitive evidence that xerostomia in and of itself causes periodontal disease or accelerates its progression.

There is no definitive evidence that xerostomic edentuloous patients with complete dentures experience more difficulties. Denture retention does not appear to be compromised and affected patients have not been shown to be more likely to develop sore spots. Edentulous xerostomic patients are, however, at greater risk for developing candidal infections.

Table 5 - Fluroide Products for the Prevention and Control of Dental Caries

Over-the-Counter Fluoride Supplements

- ACT® mouth rinse
- ACT Total Care Anticavity Rinse® for dry mouth
- Fluorigard® mouth rinse
- Gel-Kam® fluoride gel to be brushed on teeth
- Thera-Flur® drops
- Lozi-tab® chewable tablet
- Karidium® chewable tablet

Prescription Only Fluorides

- Fluoritab® drops
- Karidium®
- Fluororinse®
- Karigel®
- PreviDent®

Fluoride gels can be used with custom trays to be worn overnight for patients who have developed hyposalivation secondary to radiation therapy.

Other Readings

Clinician's Guide to Salivary Gland and Chemosensory Disorders. Brennan MT, Fox PC, eds. Available from the American Academy of Oral Medicine P.O. Box 2016, Edmonds, WA 98020.

Conclusions

This edition of the Guide has attempted to provide the practitioner with additional information that may be helpful with identifying the causes, diagnosis, and management of xerostomia or hyposalivation and its complications. Since this condition was first described in the Guide more than ten years ago, it is evident that the management of patients with xerostomia is still challenging, and definitive, causally-based therapies remain to be identified. Irrespective of its cause, xerostomia or hyposalivation is likely to become a chronic condition that may be irreversible. Treatment should, therefore, be primarily focused on caries prevention and control and palliation of symptoms.

References

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4. Drug Information Handbook for Dentistry. 22nd Edition. Wynn RL, Meiller TF, Crossley HL, (eds). Walters Kluwer; Alphen aan den Rijn, The Netherlands. 2016. www.wolterskluwerCDI.com/markets/dentistry

Additional Online Resources

http://www.nidcr.nih.gov/oralhealth

- Dry mouth/xerostomia
- Saliva and Salivary Gland Disorders
- Sjögren's Syndrome

Sjögren's Syndrome Foundation:

http://www.sjogrens.org

http://www.oralcancerfoundation.org/dental/xerostomia.htm

http://www.mayoclinic.org/diseases-conditions/dry-mouth/basics/definition/con-20035499

POST-TEST

Internet Users: This page is intended to assist you in fast and accurate testing when completing the "Online Exam." We suggest reviewing the questions and then circling your answers on this page prior to completing the online exam.

(1.0 CE Credit Contact Hour) Please circle the correct answer. 70% equals passing grade.

1. **Patients should be advised to use fluoride supplements if:**
   a. They have symptoms of dry mouth.
   b. There is clinical evidence of dry mouth.
   c. They are taking any of the medications associated with dry mouth.
   d. They have any of the concurrent diseases associated with dry mouth.

2. **Loss of saliva can develop and progress:**
   a. As patients age.
   b. If patients develop mental illnesses.
   c. As patients develop more chronic medical conditions.
   d. With increased patient stress.

3. **The degree of the discomfort associated with xerostomia is primarily based on:**
   a. Patient perception.
   b. The amount of saliva in the mouth.
   c. The number of xerogenic medications being taken.
   d. The types of xerogenic medications being taken.

4. **Which one of the following patient complaints is most likely to be accompanied by a hyposalivation:**
   a. I have lost my sense of taste.
   b. I am getting more cavities.
   c. My mouth is sore.
   d. My mouth feels dry.

5. **A number of specific and specialized laboratory studies are available to determine:**
   a. which medications cause xerostomia.
   b. which patients will be more susceptible to dental caries.
   c. which patients have developed Sjögren's syndrome.
   d. which patients have lost oral lubrication.

   .

6. **Which ONE of the following is the LEAST viable option for managing patients with xerostomia:**
   a. Changing their medications.
   b. Stimulating more saliva production.
   c. Providing artificial substitutes for saliva.
   d. Providing sources for consistent oral moisture.

7. **The most reliable method for determining if the patient has xerostomia is:**
   a. To examine the oral mucosa.
   b. To perform sialometry.
   c. To determine the number of xerogenic medications being taken.
   d. To establish the presence of diseases linked to secondary Sjögren's Syndrome.

8. **The optimal remedy for the discomfort associated with xerostomia should be focused on:**
   a. Stimulating more saliva.
   b. Keeping the mouth moist.
   c. Chewing gum.
   d. Eating moist foods.

9. **The most reliable method for validating patients' symptoms of xerostomia should be based on:**
   a. Measuring the amount of saliva production.
   b. The ability to elicit secretions from the salivary gland ducts.
   c. Patient responses to a xerostomia questionnaire.
   d. Positive laboratory tests for any of the diseases associated with xerostomia.

10. **Addressing the increased risk of dental caries in xerostomic patient should be focused on:**
    a. Preventive strategies.
    b. Generation of more saliva.
    c. Replacing the loss of the caries protective components of saliva.
    d. Implementing the use of artificial saliva substitutes.

Registration/Certification Information (Necessary for proper certification)

Name (Last, First, Middle Initial): _____

PLEASE PRINT CLEARLY

Street Address: _____ Suite/Apt. Number _____

City: _____ State: _____ Zip: _____

Telephone: _____ Fax: _____

Date of Birth: _____ Email: _____

State(s) of Licensure: _____ License Number(s): _____

Preferred Dentist Program ID Number: _____ ☐ Check Box If Not A PDP Member

AGD Mastership: ☐ Yes ☐ No

AGD Fellowship: ☐ Yes ☐ No Date: _____

Please Check One: ☐ General Practitioner ☐ Specialist ☐ Dental Hygienist ☐ Other

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Evaluation - Xerostomia Revisited 5th Edition

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	1 = POOR 1	2	3	4	5 = Excellent 5	
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2. How would you rate the quality of the content?	☐	☐	☐	☐	☐	
3. Please rate the effectiveness of the author.	☐	☐	☐	☐	☐	
4. Please rate the written materials and visual aids used.	☐	☐	☐	☐	☐	
5. The use of evidence-based dentistry on the topic when applicable.	☐	☐	☐	☐	☐	☐ N/A
6. How relevant was the course material to your practice?	☐	☐	☐	☐	☐	
7. The extent to which the course enhanced your current knowledge or skill?	☐	☐	☐	☐	☐	
8. The level to which your personal objectives were satisfied.	☐	☐	☐	☐	☐	
9. Please rate the administrative arrangements for this course.	☐	☐	☐	☐	☐	

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10	9	8	7	6	5	4	3	2	1	0
extremely likely					neutral					not likely at all

What is the primary reason for your 0-10 recommendation rating above?

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