Managing xerostomia

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IN BRIEF

VERIFIABLE CPD PAPER

- Aetiology, signs and symptoms of Salivary Gland Hypofunction (SGH).
- Diagnostic techniques.
- Management of SGH and xerostomia.
- Discussion of research, and evolving therapies for SGH and xerostomia.

Introduction

Xerostomia is a subjective complaint of dry mouth[1] that affects at least 1 in 10 adults. In those over 65 years of age, prevalence approaches 25%, while rates in institutionalised elderly people may be as high as 50%.[2] The number of medical conditions present or prescription medications being taken also increases prevalence. Xerostomia is usually associated with Salivary Gland Hypofunction (SGH), thus knowledge of SGH is useful for managing the condition.

'*Salivary lubrication, repair, lavage, antimicrobial and buffering properties contribute significantly to the maintenance of the integrity of the hard and soft oral tissue.*'[3] The three pairs of major salivary glands are the parotid, submandibular, and sublingual glands; accessory glands are situated throughout the oral mucosa. Daily, about 500 to 600 ml of whole saliva (the total output from the major and minor salivary glands) is produced (Fig. 1).

Salivary flow can be classified as normal, low, or very low by the Salivary Flow Index parameters. A Normal Unstimulated (resting) whole saliva flow rate ranges from 0.3 to 0.4 ml/min, while Normal Stimulated flow rate ranges from 1 to 2 ml/min.[4] SGH is objective evidence of reduced saliva output. It generates xerostomia when salivary flow is insufficient to compensate for loss of fluid from the mouth: saliva is consumed by swallowing, absorption by the oral mucosa, and evaporation from the mouth.

Fig. 1 Major salivary glands. Image created by Danielle L. Douglas

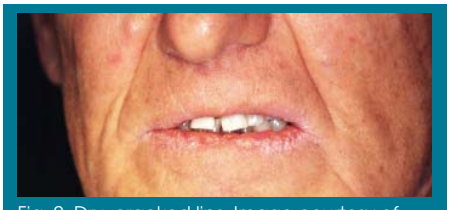


Fig. 2 Dry, cracked lips. Image courtesy of Dr Andy Wolff

Aetiology

Many oral and systemic conditions cause changes in the flow and composition of saliva. Prescription medications are implicated in 64% of xerostomia cases,[5] and over 400 current medications have been reported to cause xerostomia. Major xerogenic drug groups are antihypertensives, antidepressants, and chemotherapy drugs for treating cancer.[6] Local aetiologic factors include developmental defects of the salivary gland duct, tumours, sialoliths (salivary stones), or damage from radiation therapy for cancer. Systemic factors include thyroid disease, anxiety, mouth-breathing, diabetes, dehydration, HIV or Hepatitis C infection, or autoimmune disease such as Sjögren's syndrome.[7]

Diagnosis and risk assessment

Diagnosis starts with a thorough medical history review. The following screening questionnaire might be used for risk assessment;[8] it addresses four complaints that are most commonly associated with hyposalivation:

1. Does the amount of saliva in your mouth seem too little?
2. Do you have any difficulties swallowing?
3. Does your mouth feel dry when eating a meal?
4. Do you sip liquids to aid in swallowing dry food?

Patients who answer 'yes' to any of these four questions are at risk of abnormal salivary gland function.

Clinical signs

SGH causes thicker whole saliva, which might be frothy or stringy. There is difficulty expressing saliva from the major salivary gland ducts during palpation, and a lack of pooling saliva in the floor of the mouth. Thin, pale, dry mucosa may occur, as well as cracked lips and corners of the mouth (Fig. 2). A mirror also sticks to the tissue when retracting the cheek.

Fig. 3 Dental caries located at the roots and cusp tips. Image courtesy of Dr Andy Wolff

Fig. 4 A fissured tongue, and atrophied papillae. Image courtesy of Dr Andy Wolff

SGH symptoms include halitosis, impaired taste, a sticky, dry or burning feeling in the mouth, impaired chewing, swallowing and speech, sensitive teeth, difficulty wearing dentures, and sleep disturbance. Individuals with xerostomia also tend to make limited food choices. Complications of SGH include dental caries at the roots and cusp tips,[9] a fissured tongue and atrophied papillae, angular cheilitis, candidiasis, and chronic salivary gland enlargement (Figs 3-6).

Saliva testing aids a definitive diagnosis of SGH;[10] it determines unstimulated and stimulated saliva flow, consistency, pH, ability to buffer acids, and levels of cariogenic bacteria. Abnormally low stimulated salivary flow rates indicate SGH; a stimulated salivary flow rate below 0.7 ml/min is a predictor of caries

Fig. 5 Candidiasis. Image courtesy of Dr Andy Wolff

Fig. 6 Chronic salivary gland enlargement. Image courtesy of Dr Andy Wolff

Fig. 7 Checking minor salivary glands. Image courtesy of http://www.gcamerica.com

Fig. 8 Checking consistency of saliva. Image courtesy of http://www.gcamerica.com

Fig. 9 Unflavoured wax is chewed before testing stimulated saliva flow. Image courtesy of http://www.gcamerica.com

activity. Salivary pH should ideally be 7.0 to 7.5; 5.5 is the critical pH at which demineralisation occurs. To check levels of cariogenic bacteria (*mutans streptococci*), saliva collected is incubated at 37°C for 48 hours. Alternately, a new immunochromatography process detects bacterial levels within 15 minutes, without incubation. (Figs 7-9).

Diagnostic techniques used to detect pathologies associated with SGH include: blood testing, immunologic testing, biopsy and diagnostic imaging[11] such as Ultrasound, Magnetic Resonance Imaging, Computed Axial Tomography, Sialography, and Scintiscanning.

Treatment

The Commission on Oral Health, Research and Epidemiology (CORE) has established principles for xerostomia treatment: stimulation of secretion has the great advantage of providing the benefits of natural saliva. Most SGH cases retain a stimulable albeit reduced salivary function. Dry mouth patients are bound to remain chronic patients, thus development of a sustained-acting preparation is ideal for long-term management.

Xerostomia and SGH management can be organised into seven main goals:

1. Hydration
2. Stimulation of salivary flow
3. Saliva substitution
4. Slow the loss of functional salivary gland tissue
5. Prevent caries and promote remineralisation
6. Prevent soft tissue injury and infections
7. Improve comfort.

Hydration is improved by increasing water intake, and using an air humidifier.[12] Stimulation of salivary flow is achieved by chewing sugar-free gum, using sweeteners or flavourings, systemic medications, or sonic brushing.[13] Saliva substitutes include Casein Phosphopeptide/Amorphous Calcium Phosphate paste,[14] oral gels, dry mouth rinses, sprays, and lozenges. These contain ingredients that moisturise and lubricate (glycerine, carboxymethylcellulose, or aloe vera), buffers to reduce acidity (calcium or bicarbonate), as well as antibacterial substances (enzymes such as lysosymes and lactoperoxidase, which are also found in natural saliva).

Systemic drugs like Pilocarpine and Cevimeline[15] slow the loss of functional salivary gland tissue, as does Amifostine,[16] a chemoprotective drug that prevents salivary gland damage from chemotherapy or radiation therapy for cancer. Targeted[17] or Intensity Modulated Radiation Therapy[18] also minimises radiation exposure and damage of the salivary glands.

The following measures prevent caries[19] and soft tissue infection, and improve comfort:

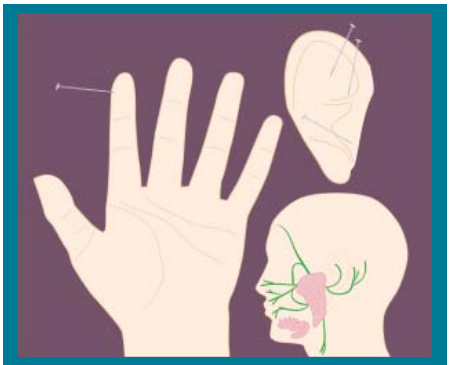


Fig. 10 Acupuncture points for stimulation of salivation. Image created by Danielle L. Douglas

- Fluoride varnish applications every 3 months
- Sealants (if required)
- Self-applied neutral fluoride gel or rinse
- Interproximal cleaning, using a tongue scraper, and brushing three to four times a day with 5000 ppm sodium fluoride paste
- Alcohol-free chlorhexidine rinses
- Xylitol products[20]
- Dietary counselling regarding sugar control
- 10% betadine rinse (every 3-4 months)
- Toothpaste for sensitive teeth
- Casein phosphopeptide/amorphous calcium phosphate paste
- Dry mouth gels (also for use under dentures).

If possible, patients should change or reduce the dosage of xerogenic drugs. Treating the causes of mouth-breathing, rinsing with water before eating, sipping water frequently, eating soft, moist foods, and removing and cleaning dentures at night is ideal. Dental visits every three months are also recommended for continuing care and support. Exacerbating factors to avoid are smoking, alcohol-based mouthwash, whitening toothpaste, tartar control products and sodium lauryl sulphate (found in some toothpaste). Patients should also avoid dry or salty foods, chewable vitamin C, acidic, sugared lozenges and alcoholic, carbonated, citrus or caffeinated drinks.

Innovative therapies

A variety of innovative therapies for SGH and xerostomia management are being investigated. One is acupuncture,[21] which stimulates increased saliva production by increasing blood flow over the parotid gland (Fig. 10).

Alternately, intra-oral electrostimulators induce salivation by applying low levels of electronic stimulation to the oral mucosa, close to the nerves controlling salivary function. These devices have demonstrated three to four-fold increases in salivary flow, and relief from xerostomia in patients with severe SGH. Prolonged use also improves the effectiveness of neural stimulation. They are either removable

mouthguard-like devices, or fixed, attached to a dental implant[22] (Figs 11-13).

Dr Bruce Baum conducts research on gene therapy, which delivers the therapeutic gene to the target cells of the patient through a carrier molecule called a vector. The most commonly used vector is a virus that has been genetically altered to carry normal human DNA. This virus enters the damaged saliva-producing cells, delivering the therapeutic gene[23] (Figs 14-15).

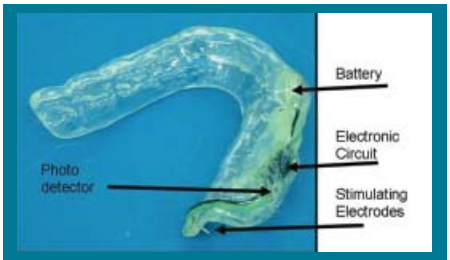
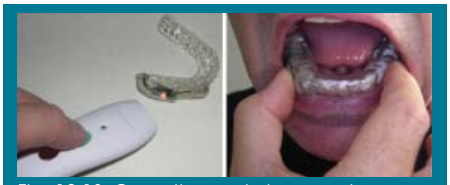


Fig. 11 Saliwell removable saliva stimulator. Image courtesy of Dr Andy Wolff



Figs 12-13 Operation and placement of saliva stimulator. Images courtesy of Dr Andy Wolff

Fig. 14 DNA strand. Image created by Danielle L. Douglas

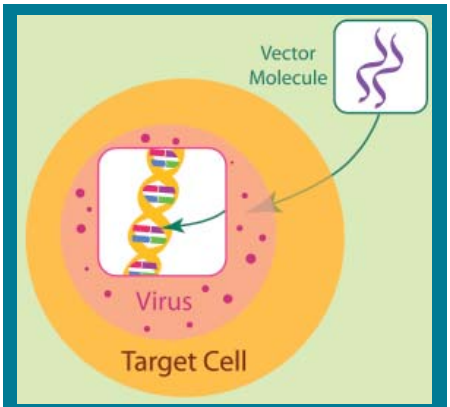


Fig. 15 Viral method of gene transfer. Image created by Danielle L. Douglas

There has also been research on immunotherapy for Sjögren's syndrome; a prototype vaccine was able to stop disease progression in mice.[24]

Conclusion

Xerostomia is an increasing problem; however, the dental care professional plays an important role in facilitating effective xerostomia management, which greatly improves the health and quality of life of the dry mouth patient. In addition, this ties in with the new concept 'Minimal Intervention Dentistry' and its emphasis on promotion of healthy saliva.

CPD questions on this article are on page 50.

Participation in verifiable CPD on this article will enhance ability to:

- Pro-actively assess patients for risk of Salivary Gland Hypofunction (SGH)
- Discuss diagnostic techniques for SGH and related pathologies
- Describe evidence-based components of a clinical maintenance protocol and self-care regimen that would be beneficial for xerostomic patients
- Discuss current research on treatment of salivary gland hypofunction and xerostomia.

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