



Top tips for management of dry mouth in primary care

By Yen Lin,¹ Claire Forbes-Haley² and Ewen McColl³

Introduction

Dry mouth is an umbrella term for the presence of either xerostomia or hyposalivation. Xerostomia is the subjective sensation of dry mouth and is medically classified as a symptom.^{1,2,3} Hyposalivation is the objective reduction in the production of saliva where there is a resting salivary flow of less than 0.1 ml per minute or less than 0.5–0.7 ml per minute when stimulated.^{4,5} This is generally due to a decline in salivary gland function.⁶ There is a variety of aetiological factors which can contribute to dry mouth (Box 1).

In this paper, we discuss the oral manifestations and some investigations associated with dry mouth, as well as top tips for managing dry mouth in primary care, in addition to highlighting treatment alternatives in secondary care.

Box 1 Causes of dry mouth^{2,3,8,10}

1. Ageing
2. Poorly controlled diabetes mellitus
3. Autoimmune diseases (eg, Sjögren's syndrome, systemic lupus erythematosus, rheumatoid arthritis, scleroderma, graft versus host disease)
4. Disorders causing difficulties in chewing and swallowing
5. Bacterial infections (eg, staphylococcus aureus, streptococcus pyogens, Escherichia coli)
6. Sialolithiasis
7. Injury to salivary glands
8. Viral infections (eg, paramyxovirus, cytomegalovirus, HIV, hepatotropic viruses)
9. Radiotherapy of the head and neck
10. Side effects of medications
11. Excessive diuresis (eg, diabetes mellitus, diabetes insipidus, nephrogenic diabetes, diuretics, renal failure, loss of urine concentration ability)
12. Salivary gland agenesis
13. Mechanical peripheral nerve injuries
14. Nutritional deficiencies, eating disorders (eg, anorexia, bulimia)
15. Dehydration
16. Oral sensory impairment
17. Idiopathic factors
18. Smoking tobacco and cannabis, drinking alcohol or caffeine
19. Decreased fluid intake
20. Loss of water through skin, alimentary tract (eg, fever, excessive sweating, vomiting, diarrhoea)
21. Excessive diuresis (eg, diabetes mellitus, diabetes insipidus, nephrogenic diabetes, diuretics, renal failure, loss of urine concentration ability)
22. Mouth breathing
23. Psychogenic factors, mental illness (eg, anorexia, depression, schizophrenia, anxiety, chronic or neurogenic pain)

Clinical presentation

Dry mouth can lead to a compromised salivary defence mechanism and reduction of lubricating components in the oral cavity. This can result in soft and hard tissue changes.

Soft tissue

The oral mucosa tends to become erythematous, painful, dry and atrophic, with patients reporting a tight feeling and burning sensation due to atrophy of papillae and angular stomatitis.^{1,7} Patients are more susceptible to salivary gland infections which is known as sialadenitis, with associated symptoms such as facial swelling, pain, pyrexia and a purulent discharge from the duct.⁸ There is also an increased susceptibility to opportunistic oropharyngeal oral infections which is known as candidosis caused by *Candida spp.* due to changes in the oral microbiome.^{2,9,10,11} This clinically manifests as white patches, erythema and a burning sensation in the oral mucosa with a higher prevalence in denture wearers.

Hard tissue

Due to a reduced salivary flow and retention of food, there is an increase in the prevalence of periodontal disease and dental decay, predominantly around the cervical margins of teeth (Fig. 1).^{2,6,9,11} This is due to demineralisation and compromised salivary buffering as well as reduced flushing with anti-bacterial peptides and mucins.¹² There is also a shift towards a cariogenic microflora and reduced pH, with osteonecrosis occurring in severe cases.¹⁰

Other symptoms

Denture wearers complain of discomfort and retention issues with their dentures. This is due to a lack of saliva at the denture-mucosa interface.^{1,2,8,13} There are also reported difficulties in chewing, swallowing, speech, communication, dysgeusia, halitosis as well as associated symptoms of impaired sleep and psychological and social disability.^{7,10}



Fig. 1 Dry mouth contributing to the build-up of plaque, resulting in periodontal disease and cervical caries

¹Honorary Clinical Lecturer in Dental Education, Peninsula Dental School (University of Plymouth), Portland Square, Plymouth, PL4 8AA, UK; ²Consultant in Restorative Dentistry, Department of Restorative Dentistry, University Hospitals Plymouth NHS Trust, Plymouth, PL6 8DH, UK; ³Director of Clinical Dentistry, Peninsula Dental School (University of Plymouth), Derriford Dental Education Facility, Plymouth Science Park, Research Way, Plymouth, PL6 8BT, UK.

Box 2 Xerostomia Inventory^{1,3,7,8,10,14,18,22,34}**Xerostomia Inventory**

1. I sip liquids to aid in swallowing food
2. My mouth feels dry when eating a meal
3. I get up at night to drink
4. My mouth feels dry
5. I have difficulty in eating dry foods
6. I suck sweets of cough lollies to relieve dry mouth
7. I have difficulties swallowing certain foods
8. The skin of my face feels dry
9. My eyes feel dry
10. My lips feel dry
11. The inside of my nose feels dry

Patients give a score between 1 (Never) to 5 (Always) and a score range between 11 (No xerostomia) to 55 (Worst possible xerostomia) is obtained.

Box 3 Local preventative measures used to manage dry mouth^{1,3,7,8,10,14,18,22,34}

1. Brush teeth twice daily with fluoride toothpaste, floss and use a fluoride mouth rinse/gel before going to bed
2. Sucking ice chips frequently
3. Ensure adequate fluid hydration by sipping cool water or sugar free drinks frequently. Rinse with water after meal times. Keep water at bedside
4. Eat foods moistened with gravies and sauces. Take small bites and eat slowly. Avoid dry or hard crunchy foods
5. Consume sugars in the diet at meal times only
6. Use mouthcare products as advised by healthcare professionals
7. Chew sugar free gum or pastilles
8. Avoid hot dry environments, consider the use of a humidifier in the bedroom
9. Remove dentures at night. Disinfect in hypochlorite
10. Tobacco products, caffeine, hot, spicy foods and alcohol should be avoided as they cause further dryness
11. Use Vaseline/lip salve for dry/cracked lips
12. Brushing/scraping your tongue to remove debris
13. Regular dental checks at least every three months, accompanied by prophylaxis and fluoride application
14. Denture adhesives may be recommended for non-retentive dentures

◀ Investigations

Dry mouth can be subjectively measured in the form of two assessment scales.

1) Challacombe Scale

This scale attempts to quantitatively categorise each feature of dryness in the mouth.^{14,15,16} It is broken down into ten distinct features (the Challacombe Dry Mouth Scale can be viewed at <https://www.challacombescale.co.uk/index.html>). Different treatment options are then allocated depending on the severity of dryness.

2) Xerostomia Inventory

This is a well-known validated summated rating scale which measures the severity of dry mouth symptoms and the response in relation to the effects of interventions for dry mouth (Box 2).⁸ It consists of 11 questions known to have an experiential and behavioural impact on dry mouth.¹ Patients give a score between 1 (Never) to 5 (Always) and a score range between 11 (No xerostomia) to 55 (Worst possible xerostomia) is obtained.

Management of dry mouth

Dry mouth involves long-term management with the aid of healthcare practitioners. Treatment is aimed at achieving any possible restoration of normal salivary flow, along with protective and symptomatic management of soft and hard tissues in cases where normal salivary flow cannot be achieved. In addition to local measures which can be carried out by clinicians in primary care (Box 3), pharmacological measures and adjunctive therapies can also be considered in a secondary care setting.¹⁷

Artificial saliva substitutes and prevention

As dental professionals, there are artificial saliva preparations which can be prescribed for patients.^{7,18,19} These can be viewed at the following site: https://www.sps.nhs.uk/wp-content/uploads/2020/02/UKMI_QA_Saliva-Substitutes_update_June-2019-1.pdf. Selection of these substitutes is dependent on lubrication effect, duration of action, taste, delivery system and price.²⁰ These work by providing a moisture retaining coating over the oral mucosa, however, only provide

temporary relief due to their short duration of action and require repeated application for long term satisfaction.^{3,21} It should be noted that some of these preparations have a high pH and should only be used in edentulous patients as repeated use can lead to dental caries. Patients who are dentate should use preparations of neutral pH.

Patients with dry mouth are considered high risk for dental caries and opportunistic infections. Therefore, the following topical fluoride adjuncts should be prescribed which can be used in conjunction with fluoride trays which act as a reservoir when indicated.^{7,21}

1. Sodium fluoride toothpaste, 0.619% (2,800 ppm)
2. Sodium fluoride toothpaste, 1.1% (5,000 ppm) (for example Colgate Duraphat)
3. Sodium fluoride mouthwash, 0.05%.

The following principles can be considered if there is medication-induced dry mouth, following liaison with the prescribing team:^{7,14,22,23}

1. Consider changing time, dose, frequency or type of medicine used
2. The use of a spacer and mouth rinsing is recommended for patients on inhaled medicines.

Sialagogues

Pilocarpine is a parasympathomimetic drug which is usually considered for patients who have undergone head and neck radiotherapy or are suffering from Sjögren's syndrome.¹⁰ It works by stimulating the muscarinic receptors in the parasympathetic nervous system, therefore increasing bodily secretions eg tears, gastric juices, mucus and saliva.^{5,21,24,25}

However, it can have a whole host of side effects proportional to an increase in dose affecting the gastrointestinal, cardiovascular, respiratory and urinary systems.^{17,26,27} The use of this drug is also contraindicated in patients with other comorbidities therefore should only be prescribed in a specialist setting.²¹ ▶▶

◀ Acupuncture

This involves the use of needles at pre-determined acupuncture points on the body for a period of 30–60 minutes. This works by stimulating the autonomic nervous system and increasing peripheral blood flow as well as stimulating tissue regeneration in radiotherapy-damaged glands.^{8,28} There is also an increase in the production of vasodilator calcitonin gene-related peptides which increases saliva secretion.²⁹ It should be noted however, that there are some associated minor complications as well as an exacerbation of any current symptoms.³⁰ It is also not advised for patients who have other comorbidities. A Cochrane review indicated that there was some evidence that acupuncture increases the saliva flow in patients with dry mouth post-radiotherapy.⁸ More research is needed to investigate its effectiveness for the long term management of dry mouth.²¹

Electrostimulation

This works by inducing salivation via intra-oral neural stimulation, where a hand-held battery-operated device is used to administer an electrical stimulus to the tongue or hard palate.⁸ Alternatively, transcutaneous electrical nerve stimulation (TENS) may also be used via electrodes connected to the skin. This results in an increase in the production of salivary flow with minimal side effects via stimulation of the efferent trigeminal fibres of the lingual nerve as well as afferent fibres which innervate the oral mucous membranes, thus resulting in stimulation of salivary reflex responses.^{26,31} There is also a reported increase in mitotic activity and cell size, thus promoting the repair of damaged nerves. It also has minimal adverse effects, with no chemical toxicity and has fewer contraindications to its use.⁴

It should be noted however, that there is no stimulation of the pain, taste and temperature receptors due to the low output of the device. The process is also complex due to portability issues and results are not consistent, therefore it is considered a less popular option for the management of dry mouth.³² Currently, new second generation devices employ the use of electrodes embedded within a removable oral splint as an attempt to simplify the process.⁸ There are also a number of factors to be considered when applying this technique such as the frequency and intensity of current, type, size and placement of stimulating electrodes as well as frequency and duration of stimulation sessions.^{4,31} A Cochrane review concluded that there is insufficient evidence to determine the effects of electrostimulation on the symptoms of dry mouth or saliva production.⁸

Conclusions

Dry mouth is a multi-factorial condition which can be difficult to manage in patients. In this short paper, we have highlighted some of the different types of local measures in primary care, as well as pharmacological and adjunctive therapies in secondary care which could be utilised to help manage this condition. Further trials should be carried out to investigate the effectiveness of adjunctive therapies in managing the symptoms of dry mouth. Following that, peer-reviewed guidelines should be used in conjunction with clinical reasoning to allow for the integration of the use of these measures to aid symptom management.³³ This should include a holistic assessment of a patient's requirements in conjunction with clinical knowledge and experience with reference to evidence-based practice. ■

Top tips are intended as a series of experiential tips, rather than a compendium of the evidence.

References

- Thomson W M. Dry mouth and older people. *Aust Dent J* 2015; **60**: 54–63.
- Scully C, Felix D H. Oral medicine – update for the dental practitioner: dry mouth and disorders of salivation. *Br Dent J* 2005; **199**: 423–427.
- Furness S, Worthington H V, Bryan G, Birchenough S, McMillan R. Interventions for the management of dry mouth: topical therapies. *Cochrane Database Syst Rev* 2011; doi: 10.1002/14651858.CD008934.pub2.
- Salimi F, Saavedra F, Andrews B, FitzGerald J, Winter S C. Trans-cutaneous electrical nerve stimulation to treat dry mouth (xerostomia) following radiotherapy for head and neck cancer. A systematic review. *Ann Med Surg (Lond)* 2021; doi: 10.1016/j.amsu.2021.01.094.
- Riley P, Glenny A M, Hua F, Worthington H V. Pharmacological interventions for preventing dry mouth and salivary gland dysfunction following radiotherapy. *Cochrane Database Syst Rev* 2017; doi: 10.1002/14651858.CD012744.
- Thomson M W. Epidemiology of oral health conditions in older people. *Gerodontology* 2014; doi: 10.1111/ger.12085.
- Johansson A-K, Johansson A, Unell L, Ekbäck G, Ordell S, Carlsson G E. Self-reported dry mouth in Swedish population samples aged 50, 65 and 75 years. *Gerodontology* 2012; doi: 10.1111/j.1741-2358.2010.00420.x
- Furness S, Bryan G, McMillan R, Birchenough S, Worthington H V. Interventions for the management of dry mouth: non-pharmacological interventions. *Cochrane Database Syst Rev* 2013; doi: 10.1002/14651858.CD009603.pub3
- Åström A N, Lie S A, Ekback G, Gülcan F, Ordell S. Self-reported dry mouth among ageing people: a longitudinal, cross-national study. *Eur J Oral Sci* 2019; **127**: 130–138.
- Anil S, Vellappally S, Hashem M, Preethanath R S, Patil S, Samaranyake L P. Xerostomia in geriatric patients: a burgeoning global concern. *J Invest Clin Dent* 2016; **7**: 5–12.
- Mehrabi F, Shanahan D, Davis G. Xerostomia. Part 1: aetiology and oral manifestations. *Dent Update* 2022; **49**: 840–846.
- Gerdin E W, Einarson S, Jonsson M, Aronsson K, Johansson I. Impact of dry mouth conditions on oral health-related quality of life in older people. *Gerodontology* 2005; **22**: 219–226.
- Johansson A K, Johansson A, Unell L, Ekbäck G, Ordell S, Carlsson G E. Self-reported dry mouth in 50- to 80-year-old Swedes: Longitudinal and cross-sectional population studies. *J Oral Rehabil* 2020; **47**: 246–254.
- Das P, Challacombe S J. Dry mouth and clinical oral dryness scoring systems. *Prim Dent J* 2016; **5**: 77–79.
- Challacombe S J, Osailan S M, Proctor G B. Clinical scoring scales for assessment of dry mouth. In Carpenter G (ed) *Dry mouth: a clinical guide on causes, effects and treatments*. pp 119–132. Berlin: Springer Berlin Heidelberg, 2015.
- King's College London. The Challacombe Scale. 2011. Available at: <https://www.challacombescale.co.uk/index.html> (accessed January 2024).
- Nayee S, Herbert C, Shirlaw P, Cook R. Dry mouth. *Dent Update* 2021; **48**: 761–768.
- Scottish Dental Clinical Effectiveness Programme. *Drug prescribing for dentistry*. 3rd edition. 2021. Available at: <https://www.sdcep.org.uk/published-guidance/drug-prescribing/> (accessed January 2024).
- Nuchit S, Lam-Ubol A, Paemuang W et al. Alleviation of dry mouth by saliva substitutes improved swallowing ability and clinical nutritional status of post-radiotherapy head and neck cancer patients: a randomized controlled trial. *Support Care Cancer* 2020; **28**: 2817–2828.
- Malallah O S, Garcia C M A, Proctor G B, Forbes B, Royall P G. Buccal drug delivery technologies for patient-centred treatment of radiation-induced xerostomia (dry mouth). *Int J Pharm* 2018; **541**: 157–166.
- Mehrabi F, Shanahan D, Davis G. Xerostomia: Part 2. investigations and management. *Dent Update* 2022; **49**: 873–878.
- Moffat A K, Apajee J, Pratt N L, Blacker N, Le Blanc V T, Roughead E E. Use of medicines associated with dry mouth and dental visits in an Australian cohort. *Aust Dent J* 2020; **65**: 189–195.
- Arany S, Kopycka-Kedzierawski D T, Caprio T V, Watson G E. Anticholinergic medication-related dry mouth and effects on the salivary glands. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2021; **132**: 662–670.
- Davies A N, Thompson J. Parasympathomimetic drugs for the treatment of salivary gland dysfunction due to radiotherapy. *Cochrane Database Syst Rev* 2015; doi: 10.1002/14651858.CD003782.pub3.
- Marchand D K, McCormack S. *Pilocarpine for radiotherapy-induced dry mouth and dry eyes: a review of clinical effectiveness, cost-effectiveness, and guidelines*. Ottawa: Canadian Agency for Drugs and Technologies in Health, 2020.
- Wolff A, Koray M, Campisi G et al. Electrostimulation of the lingual nerve by an intraoral device may lead to salivary gland regeneration: A case series study. *Med Oral Patol Oral Cir Bucal* 2018; doi: 10.4317/medoral.22597.
- Simões A, Platero M D, Campos L, Aranha A C, de Paula Eduardo C, Nicolau J. Laser as a therapy for dry mouth symptoms in a patient with Sjögren's syndrome: a case report. *Spec Care Dentist* 2009; **29**: 134–137.
- O'Regan D, Filshie J. Acupuncture and cancer. *Auton Neurosci* 2010; **157**: 96–100.
- Jedel E. Acupuncture in xerostomia – a systematic review. *J Oral Rehabil* 2005; **32**: 392–396.
- Lin J G, Chen Y H. The role of acupuncture in cancer supportive care. *Am J Chin Med* 2012; **40**: 219–229.
- Strietzel F P, Lafaurie G I, Mendoza G R B et al. Efficacy and safety of an intraoral electrostimulation device for xerostomia relief: A multicenter, randomized trial. *Arthritis Rheum* 2011; **63**: 180–190.
- Hasegawa Y, Sugahara K, Sano S, Sakuramoto A, Kishimoto H, Oku Y. Enhanced salivary secretion by interferential current stimulation in patients with dry mouth: a pilot study. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2016; **121**: 481–489.
- Towler P, Molassiotis A, Brearley S G. What is the evidence for the use of acupuncture as an intervention for symptom management in cancer supportive and palliative care: an integrative overview of reviews. *Support Care Cancer* 2013; **21**: 2913–2923.
- Davies A, Bagg J, Laverty D et al. Salivary gland dysfunction ('dry mouth') in patients with cancer: a consensus statement. *Eur J Cancer Care (Engl)* 2010; **19**: 172–177. +