Oral Health Considerations and Dental Management Guidelines and for Semaglutide Medications

Karina Kofman[1] and Aviv Ouanounou[2]

Key Messages:

- Semaglutide is effective for weight loss and diabetes, with gastrointestinal side effects (reflux, nausea) that can indirectly affect oral health.
- Oral side effects of semaglutide may occur and are manageable with proactive dental care, hygiene, hydration, fluoride, and diet.
- It highlights specific oral findings (xerostomia, halitosis, erosion, dysgeusia) and provides practical dental management guidelines

Abstract

Semaglutide, a glucagon-like peptide-1 receptor agonist, has demonstrated clinically meaningful weight-loss effects in individuals with type 2 diabetes and high body mass index, and dental practi-tioners and physicians often encounter patients who take these medications. Semaglutide is known to be associated with several systemic side effects, including delayed gastric emptying, belching, reflux and nausea, nutritional changes, and gastrointestinal discomfort. Systemic effects secondarily manifest in the oral cavity and, as a result, individuals taking semaglutide may present with xerostomia (dry mouth), halitosis (bad breath), enamel erosion tied to vomiting, and altered taste, among other oral signs and symptoms. It is important for dental professionals and physicians to become informed of possible symptoms and corresponding management strategies, given the multiple potential indirect effects on the oral cavity and relevance to dental treatment planning. In this article, we review the pharmacodynamics of semaglutide and present the current evidence on oral manifestations of the drug family and implications for dental and oral health. Practical management recommendations for dentists and the broader interdisciplinary health-care team are outlined.

Key words: dental modification, diabetes, GLP-1, oral health

Introduction

Individuals experiencing obesity or chronic overweight are seeking alternatives beyond the traditional methods of dietary and lifestyle changes, physical activity, and surgical interventions to manage their weight. Among these alternatives are pharmaceutical interventions for weight loss and type 2 diabetes management that have emerged relatively recently and gained prominence, namely medications in the semaglutide family. Also known as glucagon-like peptide-1 receptor agonists (GLP-1 RAs), semaglutide medications have induced higher percentage weight loss than any other medication.[1] The shift in weight management approaches is occurring against a backdrop of health-care systems in developed countries undergoing an obesity epidemic,[2] as the disease burden of obesity reaches unprecedented levels in the population.

Beyond weight loss and type 2 diabetes management, semaglutide medications have been shown to benefit a multitude of chronic diseases and conditions. Thus, clinicians may expect the use of semaglutide medications to persist or increase in the coming years. GLP-1 RAs have been observed to reduce adverse cardiovascular events, including arrhythmias, myocardial infarctions, angina, and stroke events, in those with high cardiovascular risk and type 2 diabetes [3] and those without diabetes

[1] Karina Kofman BSc
Faculty of Dentistry,
Dental Surgery Program, University of Toronto, Toronto, Ontario, Canada

[2] Aviv Ouanounou BSc, MSc, DDS
Faculty of Dentistry, University of Toronto, Toronto, Ontario, Canada

Address for correspondence:
Aviv Ouanounou BSc, MSc, DDS,
Faculty of Dentistry, University of Toronto, 124 Edward Street, Room 370, Toronto, Ontario M5G 1G6, Canada.
Email address:
aviv.ouanounou@dentistry.utoronto.ca

but with obesity.[4,5] In nonalcoholic severe fatty liver disease, semaglutides were shown to improve or resolve the inflammation without exasperating fibrosis.[6] Semaglutide medications have been shown to significantly reduce kidney disease progression and kidney failure,[7,8] and recent research has explored potential neuroprotective features of GLP-1 RAs in Alzheimer and Parkinson disease.[9] In the dental realm, drugs in the semaglutide family are becoming increasingly relevant due to their role in reducing blood glucose and systemic metabolic management, thereby intersecting with oral health. Studies have demonstrated an association with elevated body mass index (BMI), diabetes, and obesity, with increased rates of periodontal disease, caries, and tooth loss.[10–13] For instance, uncontrolled diabetes is a well-established risk factor in the initiation and progression of periodontitis, a chronic form of gum disease affecting the supporting structures around the teeth.[14] Glycemic management, as measured by glycated hemoglobin (A1C) level, is a grade modifier of periodontitis diagnosis, an important systemic factor that helps to characterize the rate of progression of gum disease.[15] Improved oral health reciprocally has been associated with lower BMI[12] and better nutrition. Therefore, trends in novel treatments like semaglutide are anticipated to play a positive role in mitigation of health and dental consequences of obesity and type 2 diabetes.

It is often said that the mouth serves as a window into overall health, and growing attention has been directed to appreciating the oral—systemic health link.[16] Semaglutide drugs target the digestive system, including altering the rates of gastric emptying and absorption of nutrients and modulating feelings of appetite and fullness.[17] The close neighbouring relationship between the

mouth and the digestive tract, both anatomically and functionally, beckons dentists to be aware of the unique considerations involved in caring for patients taking semaglutide medications.

In this review, we specifically explain the clinical nuggets that dental practitioners must recognize when managing a patient who takes semaglutide medications currently or historically, including a brief overview of their mechanism of action, a full explanation of oral health symptoms and side effects and their suggested mechanism, followed by management recommendations.

Limitations

As semaglutide was only approved for use within the past decade—released to the market in 2017 and approved specifically for weight loss in 2021—the research is relatively fresh, so certain areas are inevitably underreported. There have been few longitudinal studies in dentistry, and much of the existing literature is based on case reports. The clinical signs and management recommendations are supported by case reports, case series, and extrapolation from well-established dental science and known gastrointestinal effects of GLP-1 RAs, rather than by semaglutide-specific longitudinal or population-level oral health data. It is our hope that this article will stimulate further longitudinal, Canadian public health—level research into dental effects and guide practitioners in the refinement of management guidelines. In addition, we acknowledge the growing popularity of usage of similarly acting molecules besides GLP-1 RAs producing similar weightloss effects, such as liraglutide, dulaglutide, exenatide, and GLP-1/ glucose-dependent insulinotropic polypeptides, including terzepatide (Mounjaro or Zepbound). Future work is needed to identify the similarities and differences of those drug effects on the oral cavity and approaches to management.

Pharmacology of Semaglutide Drugs and Their Mechanism of Action

Ozempic, Wegovy, and Rybelsus are the brand names of semaglutide, which were brought to the market by Novo Nordisk (Bagsværd, Denmark).[18] Of the 3 brandname drugs currently offered, Wegovy, is approved in the United States and Canada for weight loss, whereas Ozempic and Rybelsus are approved mainly for diabetes but often prescribed by doctors for its off-label use of weight loss in people who are living with chronic obesity or overweight. All 3 forms of semaglutide are approved by Health Canada and the US Food and Drug Administration for individuals with and without diabetes, including those with obesity (BMI ≥30 kg/m2) and those who are living with overweight (BMI ≥27 kg/m2).[19]

Wegovy is a form of semaglutide, administered via subcutaneous injection (pen injections), specifically approved to manage obesity.[17,19] Wegovy is recommended as an adjunct to a healthy, balanced diet and regular physical activity. The drug functions potently and seemingly independently of gastrointestinal complications or initial BMI. Similarly, successful BMI reductions have been noted in teenagers. Use of Wegovy in adolescents 12 to 18 years of age who are living with obesity, combined with exercise and dietary counselling, showed better reductions in BMI when compared with placebos or controls.

A proposed mechanisms of actions have been described

in previous studies.[19–22] Semaglutide operates by acting as an agonist on the GLP-1 receptor, mimicking the effects of endogenous GLP-1 in the body. When a GLP-1 receptor is activated by semaglutide, insulin secretion is increased in response to glucose, meaning that, after a meal, semaglutide enhances glucose-dependent insulin secretion. Semaglutide is known to restrict glucagon release. It slows gastric emptying into the intestine and suppresses appetite. GLP-1 RAs are also thought to bind to GLP-1 receptors in the hypothalamus that increase feelings of fullness. Taken together, these effects of appetite control through biochemical function promote satiety and reduce the feeling of hunger. Semaglutide medications have demonstrated high efficacy in clinical trials and market results.[23,24] Figure 1 demonstrates the mechanism of action of semaglutide.

Effects of Semaglutide on Oral Cavity

Individuals taking semaglutide may experience systemic side effects that manifest in the oral cavity, which includes positive outcomes, such as better glycemic management[25] that supports periodontal health,[14] along with potential negative effects.

There is currently no evidence in the literature that semaglutide exerts a direct pharmacologic effect on tooth structure; that is, to our knowledge, no published work has presented evidence on oral or injectable GLP-1 RAs inducing a change in enamel, dentin, pulp, or the periodontal ligament. Instead, the current knowledge suggests that semaglutide can influence multiple pathways, which can have consequences for teeth indirectly. Salient side effects of semaglutides as pertaining to oral health effects are xerostomia (dry mouth), gastric reflux, vomiting, and nutritional changes.

Rather than reflecting a direct drug-to-tooth interaction, the oral implications of long-term semaglutide use arise through secondary mechanisms that may increase susceptibility to dental decay and erosion. Thus, in this review, we focus on the clinically relevant oral effects of semaglutide and their downstream impacts on teeth and oral tissues. In the popular media and lay literature, these findings have been described as "Ozempic teeth," referring to a presentation characterized by increased brittleness, possible erosion, gingival inflammation, and heightened caries risk. A summary of possible oral health–related side effects associated with semaglutide drugs and their respective management strategies are outlined in Table 1.

Xerostomia and hyposalivation

Semaglutide medications were found to be associated

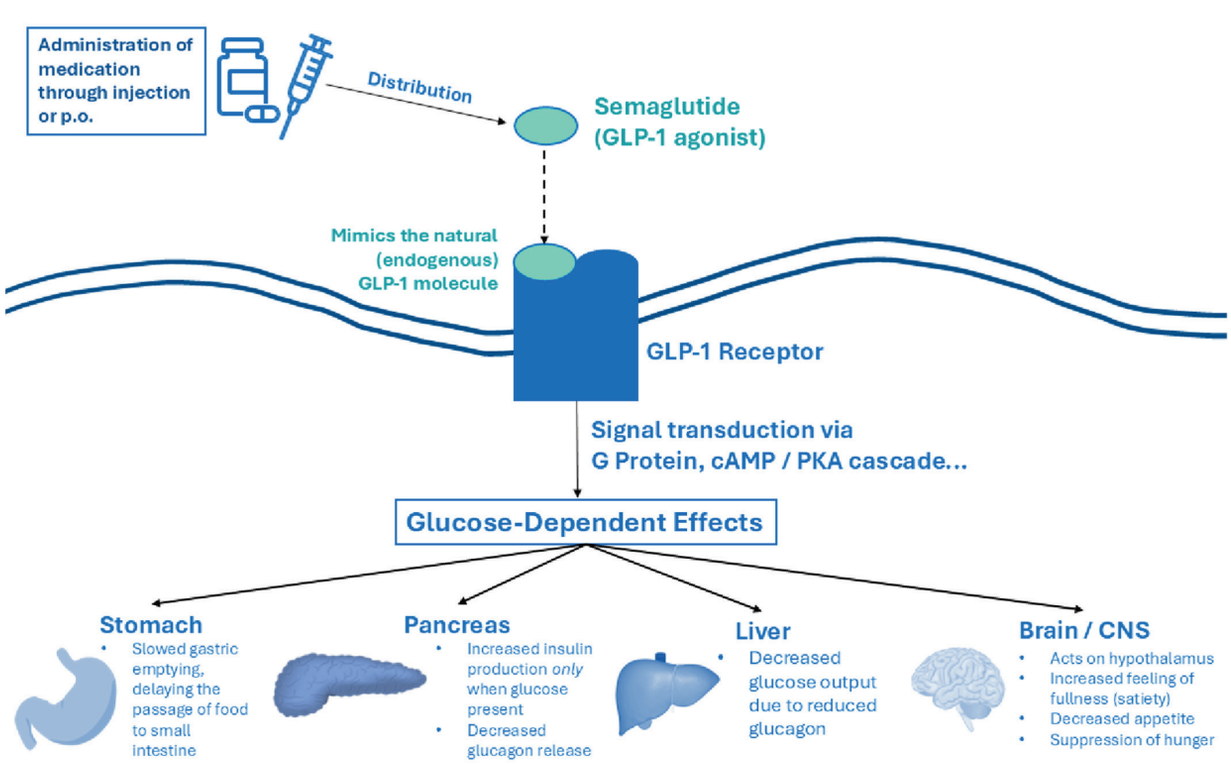

Figure 1: Pharmacodynamics of semaglutide. cAMP, cyclic adenosine monophosphate; CNS, central nervous system; GLP-1, glucagon-like peptide-1; PKA, protein kinase A.

Table 1
Oral implications of semaglutide medications—possible signs and symptoms of semaglutide-related oral health conditions and clinical tips for their management

Sign/symptom	Description	Clinical tips for management
Xerostomia and hyposalivation	• Severe dryness in the mouth • Minimal, frothy saliva • Tongue mucosa sticky, dry, and with possible hairy dorsum • Dry floor of mouth and buccal mucosa • Continued thirst despite hydration • Gingivitis (inflamed gums)	• Recommend patients to stay hydrated by drinking water and/ or sugar-free herbal teas very regularly • Chew sugar-free gum containing xylitol to stimulate production of saliva, oral moisturizers, xylitol-containing pastilles • Systemic salivary stimulants, such as pilocarpine, have been used [44] • Upkeep of meticulous oral hygiene for the purpose of mechanical plaque removal
Halitosis and belching ("Ozempic burp")	• A pungent form of bad breath • Referred to as "Ozempic breath" and "Ozempic burp," which smells of sulfur • May or may not be accompanied by xerostomia	• Use of fluoride-containing antibacterial toothpaste twice a day, with tongue scraping and flossing at least once a day • Hydration, swishing water after meals to remove food debris, which bacteria feed on to cause bad breath • Fluoride-containing mouth rinses, as needed • Conservative management, monitoring, and follow-up for dysgeusia
Dysgeusia, altered taste perception, and changes in nutrition	• Metallic/bitter taste perception and altered odor perception • Altered taste perception, calorie reductions, and changes in appetite could lead to nutritional deficiencies • Nutritional deficiencies may increase susceptibility to tooth decay, gum disease, and oral cancer risk	• Nutritional counselling, ensuring adequate vitamin and mineral intake from a healthy, balanced diet • Avoiding sugar in diet • Avoiding skipping meals, opting for several smaller meals • Maintaining consumption of nutrient-dense foods, minerals (magnesium, iron, calcium, phosphate), and vitamins (A, B, C, D, E, folate, B12) from all the food groups, including abundant intake of vegetables

Gastric reflux and nausea/ vomiting	• Many individuals on Ozempic have experienced vomiting or gastric reflux
	• Increased acidity in the mouth could lead to enamel erosion
	• Promotes the process of tooth decay
	• Erosion lesions can progress into dentin, exposing dentinal tubules and causing sensitivity
		• Dietary counselling; healthy, balanced diet
		• Plenty of fluids to rehydrate
		• Preventive regimen to minimize risk of erosion, including the following:
		  • Consulting with physician about modifying dose of semaglutide while maintaining frequency of injection to reduce vomiting
		  • See primary care physician about sugar-free antacids for temporary relief
		  • Recognizing triggers (e.g. fatty foods, spicy foods)
		  • Eating very small, nonsugary meals more often, as opposed to few large meals
		  • If a patient feels hypersensitivity of erosion lesions, consider sensitivity toothpastes containing potassium citrate, tubule occluding toothpastes containing fluoride, and restoration

Aspiration of gastric contents during surgeries under general anesthesia	• Reports of aspiration or regurgitation have emerged despite normal fasting in individuals who continued taking semaglutide medications just prior to their surgical procedures under general anesthesia	• Follow the most up-to-date guidelines for surgical planning of dental/oral/maxillofacial surgery • Consult ASA guidelines along with the more recent "STOP-GAP" framework [64], which is an algorithm that guides decision-making about perioperative semaglutide use

ASA, American Society of Anesthesiologists.

with xerostomia, also known as subjective dry mouth, a result of hyposalivation, which is reduction of salivary flow.[26] Xerostomia is well recognized to be induced by a broad range of medication classes, including anticholinergics, antidepressants, antipsychotics, antihistamines, narcotics, and antihypertensives.[27] The high prevalence of xerostomia in the elderly population occurs in part because seniors frequently take one or multiple medications.[26,28,29]

Saliva is normally responsible for playing an essential role in lubrication, antimicrobial protection, clearing food debris, and aiding function, namely chewing, speaking, swallowing, and taste enhancement.[30,31] For patients who wear dentures as a dental prosthetic (tooth replacement) solution, saliva is one of the methods of retention to ensure the denture does not fall out. Salivary enzymes and immunoglobulins protect and prevent against infection. Saliva buffers the pH in the mouth, providing a proper pH and helping to reset the pH after every meal.[32] In addition, saliva is a reservoir that supplies essential minerals, such as calcium and phosphorus, which aid in the remineralization process of tooth enamel. [32–34]

Diminished salivary flow rate can vary in severity and have broad consequences for teeth, gingiva, oral mucosa, and function.[35,36] Clinically, patients with xerostomia report symptoms of a heightened sensation of oral dryness, or burning in their mouth, lips, or tongue.[37] The oral tissues feel dry and sticky, and the patient may feel persistent thirst. The saliva may appear ropey, stringlike, and thick. Denture wear xerostomia.[44] Xerostomia was found to be a side effect stemming from semaglutide use. Semaglutide medications were linked to severe dryness in the mouth. Minimal, frothy saliva resulted in mucosa on the tongue appearing sticky and dry, sometimes with a hairy dorsal surface. Furthermore, taking the drug was associated with a near-complete lack of saliva in the floor of the mouth. Despite all 3 patients hydrating with between 1.3 and 2.5 L of water daily, all had continued thirst even after drinking water. The authors initially considered a diagnosis of dehydration, but they ruled it out due to the prolonged "severity and duration."

Although the precise mechanism of xerostomia stemming from Ozempic use is not yet a fully established causal relationship based on experimental salivary gland data, a recent study exploring xerostomia and semaglutide presented a tripartite synthesis of mechanistic domains potentially at play: albumin, beta-arrestin, and Gs/cAMP signals.[45] Given that the xerostomia and semaglutide association has biological plausibility and manifests clinically, it is important to monitor patients who start semaglutide for dry mouth and apply preventive measures to mitigate the harmful consequences of xerostomia, including dental caries, root caries, mucosal complication, gingivitis, oral discomfort, and disruptions to oral function. becomes a challenge,[35,38] as does speaking, chewing, and swallowing. The patient may present with fissured lips, oral mucosal ulceration, and malodor.[28,36,37] The dryness in the mouth could also lead to pathologic overgrowth of oral yeast Candida, resulting in increased likelihood of Candida infections (oral thrush).[39]

Hyposalivation increases risk of dental decay (dental caries)[28] through prolonged oral acidity, reduced buffering, and inadequate mineral supply to enamel for remineralization.[40] Saliva buffers the pH in the mouth, so reduced saliva often leads to prolonged acidity and reduced pH, which are the classical conditions for cavity formation. The mineral structure of enamel on the outer layer of teeth is less likely to go through remineralization due to fewer minerals being supplied to its surface via saliva. A drier environment in the mouth means sugars and food particles linger on tooth structure without being mechanically removed immediately.[40] In elderly patients with exposed tooth root surfaces, xerostomia has been associated with elevated prevalence of root caries,[41,42] forming cavitations on exposed root surfaces of the teeth.

Gingival health is also affected by hyposalivation; patients with xerostomia may present with red gums that bleed more easily due to plaque buildup and lack of salivary cleansing. This makes the gums more prone to invasion by bacteria. The buildup of plaque along the gumline increases the risk of gingivitis [28,43], which presents as red, swollen, and bleeding gums.

A recent case series from Saudi Arabia presented the cases of 3 women who had been using Ozempic for between 6 and 16 weeks, and experienced dry lips, extreme hyposalivation, and xerostomia.[44] Xerostomia was found to be a side effect stemming from semaglutide use. Semaglutide medications were linked to severe dryness in the mouth. Minimal, frothy saliva resulted in mucosa on the tongue appearing sticky and dry, sometimes with a hairy dorsal surface. Furthermore, taking the drug was associated with a near-complete lack of saliva in the floor of the mouth. Despite all 3 patients hydrating with between 1.3 and 2.5 L of water daily, all had continued thirst even after drinking water. The authors initially considered a diagnosis of dehydration, but they ruled it out due to the prolonged "severity and duration."

Although the precise mechanism of xerostomia stemming from Ozempic use is not yet a fully established causal relationship based on experimental salivary gland data, a recent study exploring xerostomia and semaglutide presented a tripartite synthesis of mechanistic domains potentially at play: albumin, beta-arrestin, and Gs/cAMP signals.[45] Given that the xerostomia and semaglutide association has biological plausibility and manifests clinically, it is important to monitor

patients who start semaglutide for dry mouth and apply preventive measures to mitigate the harmful consequences of xerostomia, including dental caries, root caries, mucosal complication, gingivitis, oral discomfort, and disruptions to oral function.

Intraoral and extraoral halitosis

Patients who take Ozempic and other semaglutide drugs may report experiencing pronounced halitosis, or sustained bad breath,[44] including belching.[46] In the popular media, this has been termed as "Ozempic breath" and "Ozempic burp." This abnormally pungent breath may be associated with slowed digestion. If food moves through the digestive system more slowly, food particles stay in the mouth and stomach for longer, where they are thought to contribute to a bad scent. Xerostomia further amplifies halitosis by increasing bacterial load and reducing the moisture and natural cleansing of the mouth.[47]

Halitosis is a common condition with varying etiologies.[48] Two major conceptual divisions of halitosis include intraoral and extraoral halitosis. In general, the most common cause of bad breath is related to intraoral causes, in many cases poor oral hygiene.[48] Oral malodor coming from within the mouth is directly correlated with bacterial load, including plaque buildup on teeth and gums and a tongue coating. Bacteria of the mouth break down these food particles and produce volatile sulfur compounds, which are largely responsible for intraoral halitosis. [49] Halitosis may also stem from extraoral causes, including those of gastrointestinal origin. Halitosis seen in patients taking semaglutide may also be linked to an extraoral gastrointestinal condition and regurgitation/reflux. Semaglutide users may be prone to delayed gastric emptying and acid reflux,[50] and these factors can contribute to belching and bad breath.

Diagnostic evaluation should include a review of medical and dental history, including medications, oral hygiene habits, plaque accumulation, and flossing and brushing frequency, and tongue coating should be assessed. The intraoral evaluation should include examining plaque and calculus, tonsils, food impaction between teeth, tongue coatings, and presence of any plaque or oral debris. Xerostomia goes hand in hand with oral malodor because reductions in salivary flow increase bacterial load and cause both dry mouth and bad breath.

Higher insulin levels that slow down digestion may lead to a state of gut dysbiosis, by which the backlog of food bacteria in the gut results in microbial metabolites and odorous compounds. Upon slow digestion, this leaves more time for food to linger in the mouth and promote dysbiotic bacterial growth in the gut, paralleling that which dentists are accustomed to taking place in the mouth. It must be determined whether the rotting-like smell primarily originates from a backlog of food in the gut (extraoral), the mouth (intraoral), or both.

Dysgeusia, Ozempic tongue, and altered nutrition

Changes in taste perception, termed dysgeusia, has been reported by patients taking semaglutide medications. Patients described changes in their taste perception.[51-53] Some patients have developed a metallic or bitter taste in the tongue and mouth.[51] This may affect appetite and food intake.

Semaglutide medications have been associated with changes in taste, as well as appetite, the latter of which can impact an individual's nutritional status, as they either skip meals or reduce their nutrient intake. Individuals taking GLP-1 RAs for obesity experienced caloric reductions of 16% to 39%, which could increase their risk for deficient vitamin and mineral intake[54,55] and inadequate protein intake.[56] A reduction in vitamins, minerals, protein, and consumption of fruits and vegetables is known to contribute to oral health concerns, including gum disease, enamel hypocalcification, dental decay, tissue inflammation, and increased oral cancer risk.[57-59]

Fundamental ethical principles

Semaglutide's delay of gastric emptying can predispose a patient to feelings of fullness, gastroesophageal reflux, nausea, and vomiting.[53] Reflux and nausea/vomiting introduce strongly acidic gastric contents into the mouth. Repeated or prolonged exposure to gastric juices can leave excessive residual acidity in the oral cavity, and such regurgitation can lead to tooth erosion.[60] Erosion risk is a function of frequency and severity of vomiting episodes, but occasional vomiting or reflux will not likely cause pronounced erosion unless it becomes chronic.

Endogenous acids from vomiting typically affect the lingual surfaces of the teeth, which are the teeth surfaces facing the back of the mouth. On clinical examination, these lesions look smooth, shallow, and cupped, often with yellowish, glossy enamel that is more translucent and possibly sensitive. Erosion is a class of noncarious lesions in which the acid irreversibly degrades the tooth structure. Abnormal acidic conditions in the mouth lead to the demineralization of the surface layers of enamel. Erosion may lead to patient complaints about varying degrees of tooth sensitivity (acute painful response of tooth to hot, cold, sweets, and/or temperature) due to exposure of dentinal tubules.[61]

It is important to identify signs of erosion early due to the irreversible nature of erosion, the lack of regeneration capability of enamel, and the clinical difficulty in restoring

eroded teeth to what they once were.

Although additional research is needed to identify any association between semaglutide and erosion of enamel at the population level, pH reduction below criticality throughout episodes of frequent reflux or vomiting could promote erosion and raise susceptibility to tooth decay.

Surgical Considerations

Delayed gastric emptying and increased regurgitation present serious concerns for patients undergoing sedation or general anesthesia for dentoalveolar and maxillofacial surgery, due to heightened risk of intraoperative aspiration. Recent case reports have described patients aspirating on gastric contents or regurgitating them during general anesthesia, despite fasting for the standard number of hours beforehand.[62] Reputable anesthesiology groups have provided updated recommendations regarding perioperative management. Proper anesthesia is important to consider when a patient is proceeding with dental extraction or surgery, especially when it includes moderate/deep sedation or general anesthesia. It is advised for clinicians to consult the most up-to-date guidelines, such as those of the American Society of Anesthesiologists (ASA), for best practices.[63] As of 2023, the ASA's recommendation was to hold the weekly GLP-1 RA medications for at least 1 week prior to elective procedures that require administration of general anesthesia.

More recently, the STOP-GAP algorithm 64 was introduced from Canada to guide clinical decision-making about the continuation or cessation of semaglutide medications perioperatively. Instead of making broad recommendations, the STOP-GAP framework considers the more nuanced snapshot of a patient's glycemic index, risk of aspiration, whether the surgery is elective or emergent, whether the operation uses general anesthesia or sedation, timing of semaglutide administration, and the kinds of symptoms the patient experiences. The algorithm does not recommend stopping semaglutide in all cases, as it acknowledges the variable risk accompanying each individual scenario:[64]

> Most individuals do not need to have their GLP-1 RA therapy withheld prior to elective surgeries or procedures since the risk of pulmonary aspiration is low in most people. People at higher risk for RGC [retained gastric contents] or pulmonary aspiration should have their GLP-1 RAs withheld prior to elective general anesthesia, deep sedation, or upper GI [gastrointestinal] endoscopy. Wherever possible, avoid scheduling elective surgery for individuals who have been taking a long-acting GLP-1 RA for ≤16 weeks or if the GLP-1 RA regimen is still in the titration phase at the time of the procedure. If a GLP-1 RA is to be withheld, hold it for ≥3 half-lives, to afford ~88% clearance of the drug, ahead of high-risk procedures for agents with a prolonged half-life and ≥5 half-lives for daily administered agents with shorter half-lives. pp.407-408

According to Goldenberg et al's STOP-GAP framework, examples of individuals at higher risk of retained gastric content aspiration include those who take long-acting GLP-1 RAs for <16 weeks (this includes semaglutide and tirzepatide); those taking short-acting GLP-1 RAs, such as exenatide and lixisenatide; those with gastrointestinal symptoms; those diagnosed with gastroparesis; those taking other medications that slow gastric emptying; or those with poor glycemic management with an A1C level >9%.[64]

Therefore, if the operation cannot be delayed and the surgery proceeds, the cessation time for a high-risk individual would depend on the drug's half-life. Oral semaglutide (Rybelsus) and injectable semaglutides (Ozempic and Wegovy) both have half-lives of 7 days. Therefore, the cessation time according to this algorithm is cited as 21 days.[64] Cessation of semaglutide for 3 weeks is enough time for a rebound of the patient's BMI and blood glucose levels; therefore, dental surgeons who plan to perform the surgery with the patient under sedation or general anesthesia must proceed with caution, consult the patient's physician, and adhere closely to the most current guidelines.

Management Guidelines for a Patient on Ozempic

Oral hygiene instruction

Oral hygiene instruction and consistent home care that includes mechanical dental plaque removal is a top priority. Oral hygiene preventive measures include brushing twice daily for 2 minutes at a time with a manual or electric toothbrush, flossing daily to remove plaque buildup between teeth, dental check-ups, periodontic examinations, and scaling. Patients with xerostomia, reflux, or high caries risk require shorter intervals between dental recall appointments, with a 3- to 4-month recall suggested for high-risk patients, although this frequency is best discussed with the patient's dentist and hygienist.

Hydration and salivary stimulation

Patients should be encouraged to stay hydrated and drink plenty of fluids. Water is preferred, non—sugar-containing tea is permissible, and oral mucosa in the oral cavity and oropharynx should be kept moist.

To stimulate saliva production by the glands, xylitol-containing gum (sugar-free) or xylitol pastilles can be used safely. Xylitol is a sugar alcohol and popular non-nutritive sweetener that has anticariogenic properties.[65] Gum, when

used as a masticatory stimulant, can be chewed to stimulate saliva production and secretion, which helps patients on semaglutide medication to reap the benefits of their own saliva, buffer their oral pH, clear food debris, and enhance the remineralization of their enamel.

Systemic salivary stimulants, such as the cholinergic agonist pilocarpine, have also been used to manage severe xerostomia in patients with various medication-induced cases of xerostomia, including those from semaglutide.[44]

Vomiting and acid reflux reduction

Individuals taking Ozempic are at greater risk for enamel erosion if they are prone to reflux and vomiting.[50,66] Individuals experiencing such regurgitation may benefit from eating smaller and more frequent meals. They should also avoid acidic foods or foods/behaviours that trigger their gastroesophageal reflux disease—like symptoms, including acidic foods, certain fatty foods (for some), and smoking. In times of excessive vomiting, patients are advised to be mindful of overuse of anti-nausea lozenges containing sugars, as continuous sucking of sugary lozenges increases bacterial acid production and heightens risk of caries.

Possible preventive interventions include modifying the course of semaglutide treatment to reduce vomiting, addressing the nausea, and implementing preventive home care measures to protect the teeth through neutralization. Patients are not advised to brush immediately after vomiting, as tooth enamel is softened and vulnerable to mineral loss after an immediate acid attack. Instead, they may rinse with water immediately, then wait 30 to 60 minutes to brush their teeth gently with a soft toothbrush and fluoride-containing toothpaste, to prevent excessive wearing away of already demineralized enamel.[67] In addition, it is beneficial to use a mild baking soda (sodium bicarbonate) solution to neutralize acid and to incorporate nutritious, sugar-free, protein-rich snacks throughout the day to avoid hefty meals—as recommended in obstetric contexts of management of nausea and vomiting and applied to our discussion here as well.[68]

Halitosis management

Although chemical agents, such as mouthwashes, may be used as an adjunct in these cases for personal relief, evidence supports the best way to manage halitosis is a combination of increased hydration and oral hygiene, including brushing and flossing. The toothpaste should be antibacterial and preferably zinc-containing, to help neutralize the volatile sulfur compounds and kill the odor-causing bacteria. A tongue scraper can be used to gently reduce bacterial load on the tongue. Patients are advised to stay on top of dental hygiene appointments once every 4 to 6 months for manual plaque removal by a registered dental hygienist.

Nutritional adequacy

With losses of appetite and drastic caloric reductions that may accompany semaglutide use stemming from a slowdown in digestion, reduced hunger, and loss of appetite, patients should continue seeking dietary counselling and ensure they adhere as much as possible to a healthy, balanced diet for proper uptake of nutrient-dense foods, minerals (magnesium, iron, calcium, phosphate), and vitamins (A, B, C, D, E, folate, B1 2) from all the food groups, including abundant vegetable intake. A healthy, balanced diet remains an important part of oral and systemic health.

Adjunctive preventive measures

Supplemental recommendations include the following:

- Salivary stimulants, such as sugar-free gums or lozenges containing xylitol because masticatory/gustatory stimulants tend to improve saliva flow and reduce dry mouth.
- Topical fluoride treatments (toothpaste, rinses, in-office gels and varnishes) to protect enamel against the effects of reduced saliva (caries risk) and acid erosion, especially during bouts of vomiting or reduced salivation. A preventive regimen can be designed in collaboration with the dental care team.

Surgery and anesthesia considerations

For dental procedures that require administration of sedation or general anesthesia, it is imperative to consult with anesthesiology societies and dental colleges for up-to-date recommendations.[63] Cases may require pause of semaglutide injections in accordance with the drug's half-life preoperatively for oral surgery to reduce the likelihood of aspiration and regurgitation of retained gastric contents intraoperatively.

Discussion: Impact and Connection to Public Health

Semaglutide has quickly become a central part of the weight management strategy used by licensed healthcare practitioners worldwide. The widespread use of this drug happened relatively rapidly over the past several years. This represents a significant pivot in how practitioners manage patients with obesity and overweight and has already demonstrated great success in reducing obesity-related comorbidities such as diabetes and cardiovascular diseases. Thus, semaglutide has the potential to reduce the overall burden of obesity, diabetes, and associated chronic diseases in the global population, improving quality of life for individuals and reducing healthcare expenditures. Coordination of care among providers, including dentists,

is crucial to ensure safe and comprehensive management. Although there is no current evidence to support the direct pharmacologic impact of semaglutide drugs on teeth specifically, this family of medications is associated with secondary oral and systemic manifestations that fall into the dental scope. As reviewed, there are a multitude of potential indirect effects of semaglutide on the oral cavity that are in a dentist's purview to diagnose, prevent, and manage, such as dry mouth (xerostomia), halitosis, and enamel erosion linked to reflux and vomiting. In addition, surgical considerations must be taken for a dental or oral surgeon planning dentoalveolar and maxillofacial surgery due to the potential risk of aspiration of gastric contents perioperatively in patients with elevated risk and taking semaglutide. Management recommendations to protect the integrity of the oral cavity are under the purview of dental generalists and specialists alike. The integration of dental care into the broader care plan for patients who take semaglutide supports an interprofessional approach to obesity and diabetes management. Successfully and safely implementing semaglutide medication as an obesity intervention requires a holistic approach, and dentists are key players in this comprehensive health-care treatment.

Author Disclosures

Conflicts of interest: None

Author Contributions

A.O. and K.K.: contributed to the conception and design of the review, conducted the literature search, data extraction, and drafted the manuscript; A.O. reviewd the interpretation of the literature, provided critical revisions, and supervised the overall development of the work. Both authors reviewed and approved the final manuscript.

References

1. Chao AM, Tronieri JS, Amaro A, Wadden TA. Semaglutide for the treatment of obesity. Trends Cardiovasc Med 2023;33:159—66.

2. Balasundaram P, Daley SF. Public health considerations regarding obesity. February 2025. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing, 2026.

3. Yao Y, Liu N, Chen S, Sun M, Guo Y. Semaglutide reduces cardiovascular events in type 2 diabetes: A systematic review and meta-analysis high-lighting enhanced benefits in chronic kidney disease. Eur J Med Res 2025;30: 1059.

4. Lincoff AM, Brown-Frandsen K, Colhoun HM, Deanfield J, Emerson SS, Esbjerg S, et al. Semaglutide and cardiovascular outcomes in obesity without diabetes. N Engl J Med 2023;389:2221—32.

5. Wu R, Xing B, Zhou Z, Yu L, Wang H. Effect of semaglutide on arrhythmic, major cariovascular, and renal outcomes in patients with overweight or obesity: A systematic review and meta-analysis. Eur J Med Res 2025;30:835.

6. Newsome PN, Buchholtz K, Cusi K, Linder M, Okanoue T, Ratziu V, et al. A placebo-controlled trial of subcutaneous semaglutide in nonalcoholic steatohepatitis. N Engl J Med 2021;384:1113—24.

7. Perkovic V, Tuttle KR, Rossing P, Mahaffey KW, Mann JFE, Bakris G, et al. Effects of semaglutide on chronic kidney disease in patients with type 2 diabetes. N Engl J Med 2024;391:109—21.

8. Economos H, MacIsaac RJ. Cardio-kidney-metabolic protective effects of semaglutide across the spectrum of chronic kidney disease. World J Nephrol 2025;14:109457.

9. Meca AD, Boboc IKS, Mititelu-Tartau L, Bogdan M. Unlocking the potential: Semaglutide's impact on Alzheimer's and Parkinson's disease in animal models. Curr Issues Mol Biol 2024;46:5929—49.

10. Deszczńska K, Górska R, Hałady j A. Clinical condition of the oral cavity in overweight and obese patients. Dent Med Probl 2021;58:147—54.

11. Fruh SM. Obesity: Risk factors, complications, and strategies for sustainable long-term weight management. J Am Assoc Nurse Pract 2017;29(Suppl. 1): S3—14.

12. Issrani R, Reddy J, Bader AK, Albalawi RFH, Alserhani EDM, Alruwaili DSR, et al. Exploring an association between body mass index and oral health—a scoping review. Diagnostics (Basel) 2023;13.

13. Arslan ZB. Evaluation of the relationship between oral health and body mass index. Eurasian J Med 2023;55:259—62.

14. Păunică I, Giurgiu M, Dumitriu AS, Păunică S, Pantea Stoian AM, Martu MA, et al. The bidirectional relationship between periodontal disease and diabetes mellitus—a review. Diagnostics (Basel) 2023;13.

15. Tonetti MS, Greenwell H, Kornman KS. Staging and grading of periodontitis: Framework and proposal of a new classification and case definition. J Periodontol 2018;89(Suppl. 1):S159—72.

16. Bhatnagar DM. Oral health: A gateway to overall health. Contemp Clin Dent 2021;12:211—2.

17. Friedrichsen M, Breitschaft A, Tadayon S, Wizert A, Skovgaard D. The effect of semaglutide 2.4 mg once weekly on energy intake, appetite, control of eating, and gastric emptying in adults with obesity. Diabetes Obes Metab 2021;23: 754—62.

18. Wojtara M, Mazumder A, Syeda Y, Mozga1a N. Glucagon-like peptide-1 receptor agonists for chronic weight management. Adv Med 2023;2023: 9946924.

19. Kommu S, Whitfield P. Semaglutide. February 2024. In: StatPearls [Internet]. Treasure Island (FL). StatPearls Publishing, 2026.

20. Mahapatra MK, Karuppasamy M, Sahoo BM. Semaglutide, a glucagon like peptide-1 receptor agonist with cardiovascular benefits for management of type 2 diabetes. Rev Endocr Metab Disord 2022;23:521—39.

21. Papakonstantinou I, Tsioufis K, Katsi V. Spotlight on the mechanism of action of semaglutide. Curr Issues Mol Biol 2024;46:14514—41.

22. Drucker DJ. Mechanisms of action and therapeutic application of glucagon-like peptide-1. Cell Metab 2018;27:740—56.

23. Ryan DH, Lingvay I, Deanfield J, Kahn SE, Barros E, Burguera B, et al. Long-term weight loss effects of semaglutide in obesity without diabetes in the SELECT trial. Nat Med 2024;30:2049—57.

24. Del Prete M, Gavazzi L, Disoteo OE, Vignati F, Di Sacco G, Muratori F. Real-world effectiveness of semaglutide treatment on weight loss maintenance after weight loss in patients with obesity or overweight and diabetes. Eat Weight Disord 2025;30:2.

25. Alzahrani M, Rammal L, Felemban R, Khan M, Saad H, Alrezqi M, et al. Effects of semaglutide on glycemic control and body weight in patients with type 2 diabetes: A retrospective cohort study in a primary care setting. Cureus 2025;17:e82123.

[26] Ito K, Izumi N, Funayama S, Nohno K, Katsura K, Kaneko N, et al. Characteristics of medication-induced xerostomia and effect of treatment. PLoS One 2023;18:e0280224.

27. Choo PJ, Taing M-W, Teoh L. A retrospective study of drugs associated with xerostomia from the Australian Database of Adverse Event Notifications. Int J Pharm Pract 2022;30:548—53.

28. Talha B, Swarnkar SA. Xerostomia. March 2023. In: StatPearls [Internet]. Treasure Island (FL). StatPearls Publishing, 2026.

29. Astor FC, Hanft KL, Ciocon JO. Xerostomia: A prevalent condition in the elderly. Ear Nose Throat J 1999;78:476—9.

31. Llena-Puy C. The role of saliva in maintaining oral health and as an aid to diagnosis. Med Oral Patol Oral Cir Bucal 2006;11:E449—55.

31. Dawes C, Pedersen AM, Villa A, Ekström J, Proctor GB, Vissink A, et al. The functions of human saliva: A review sponsored by the World Workshop on Oral Medicine VI. Arch Oral Biol 2015;60:863—74.

32. Marsh PD, Do T, Beighton D, Devine DA. Influence of saliva on the oral microbiota. Periodontol 2000 2016;70:80—92.

33. Farooq I, Bugshan A. The role of salivary contents and modern technologies in the remineralization of dental enamel: A narrative review. F1000Res 2020;9:171.

34. Enax J, Fandrich P, Schulze Zur Wiesche E, Epple M. The remineralization of enamel from saliva: A chemical perspective. Dent J (Basel) 2024;12.

35. Cassolato SF, Turnbull RS. Xerostomia: Clinical aspects and treatment. Gerodontology 2003;20:64—77.

36. Barbe AG. Medication-induced xerostomia and hyposalivation in the elderly: Culprits, complications, and management. Drugs Aging 2018;35:877—85.

37. Mortazavi H, Baharvand M, Movahhedian A, Mohammadi M, Khodadoustan A. Xerostomia due to systemic disease: A review of 20 conditions and mechanisms. Ann Med Health Sci Res 2014;4:503—10.

38. Mhatre S, Srichand R, Sethumadhavan J, Mishra PB, Patil SD, Chavan RS, et al. Dry mouth dilemma: A comprehensive review of xerostomia in complete denture wearers. Cureus 2024;16:e58564.

39. Molek M, Florenly F, Lister INE, Wahab TA, Lister C, Fioni F. Xerostomia and hyposalivation in association with oral candidiasis: A systematic review and meta-analysis. Evid Based Dent 2022:1—7. https://doi.org/10.1038/s41432-021-0210-2.

40. Su N, Marek CL, Ching V, Grushka M. Caries prevention for patients with dry mouth. J Can Dent Assoc 2011;77:b85.

41. Papas AS, Joshi A, MacDonald SL, Maravelis-Splagounias L, Pretara-Spanedda P, Curro FA. Caries prevalence in xerostomic individuals. J Can Dent Assoc 1993;59(171—4):177—9.

42. Youngs G. Risk factors for and the prevention of root caries in older adults. Spec Care Dentist 1994;14:68—70.

43. Mizutani S, Ekuni D, Tomofuji T, Azuma T, Kataoka K, Yamane M, et al. Relationship between xerostomia and gingival condition in young adults. J Periodontal Res 2015;50:74—9.

44. Mawardi HH, Almazrooa SA, Dakhil SA, Aboalola AA, Al-Ghalib TA, Eshky RT, et al. Semaglutide-associated hyposalivation: A report of case series. Medicine (Baltimore) 2023;102:e36730.

45. Barać M, Roganović J. GLP-1 receptor signaling and oral dysfunction: A narrative review on the mechanistic basis of semaglutide-related oral adverse effects. Biology (Basel) 2025;14.

46. Collins L, Costello RA. Glucagon-like peptide-1 receptor agonists. February 2024. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing, 2026.

47. Bollen CM, Beikler T. Halitosis: The multidisciplinary approach. Int J Oral Sci 2012;4:55—63.

50. Kashima S, Moriichi K, Fujiya M. Severe reflux oesophagitis caused by repeated vomiting due to glucagon-like peptide-1 receptor agonist. BMJ Case Rep 2025;18.

51. Volpe S, Lisco G, Fanelli M, Racaniello D, Colaianni V, Lavarra V, et al. Oral semaglutide improves body composition and preserves lean mass in patients with type 2 diabetes: A 26-week prospective real-life study. Front Endocrinol (Lausanne) 2023;14:1240263.

52. Khan FI, Vazquez SG, Mehdi Z, Somawardana I, Dongre R, Razmi S, et al. Otolaryngologic side effects of GLP-1 receptor agonists. Laryngoscope 2025; 135:2291—8.

53. Fass R, McCallum RW, Parkman HP. Treatment challenges in the management of gastroparesis-related GERD. Gastroenterol Hepatol (NY) 2009;5-(Suppl. 18):4—16.

54. Mozaffarian D, Agarwal M, Aggarwal M, Alexander L, Apovian CM, Bindlish S, et al. Nutritional priorities to support GLP-1 therapy for obesity: A joint advisory from the American College of Lifestyle Medicine, the American Society for Nutrition, the Obesity Medicine Association, and the Obesity Society. Am J Lifestyle Med, 2025:15598276251344827.

55. Christensen S, Robinson K, Thomas S, Williams DR. Dietary intake by patients taking GLP-1 and dual GIP/GLP-1 receptor agonists: A narrative review and discussion of research needs. Obes Pillars 2024;11:100121.

56. Barrea L, Annunziata G, Verde L, Galasso M, Savastano S, Colao A, et al. A multidisciplinary perspective on semaglutide treatment and medical nutrition therapy in obesity management. Curr Obes Rep 2025;14:73.

57. Rahman N, Walls A. Chapter 12: Nutrient deficiencies and oral health. Monogr Oral Sci 2020;28:114—24.

58. Rodríguez-Molinero J, Migueláñez-Medrán BDC, Puente-Gutiérrez C, Delgado-Somolinos E, Martín Carreras-Presas C, Fernández-Farhall J, et al. Association between oral cancer and diet: An update. Nutrients 2021;13.

59. Hung M, Blazejewski A, Lee S, Lu J, Soto A, Schwartz C, et al. Nutritional deficiencies and associated oral health in adolescents: A comprehensive scoping review. Children (Basel) 2024;11.

60. Ranjitkar S, Kaidonis JA, Smales RJ. Gastroesophageal reflux disease and tooth erosion. Int J Dent 2012;2012:479850.

61. West N, Seong J, Davies M. Dentine hypersensitivity. Monogr Oral Sci 2014; 25:108—22.

62. Avraham SA, Hossein J, Somri F, Hawash N, Hochman O. Pulmonary aspiration of gastric contents in two patients taking semaglutide for weight loss. Anaesth Rep 2024;12:e12278.

63. Joshi GP, Abdelmalak BB, Weigel WA, Soriano SG, Harbell MW, Kuo CI, et al. American Society of Anesthesiologist (ASA) Task Force on Perioperative Fasting: American Society of Anesthesiologists consensus-based guidance on preoperative management of patients (adults and children) on glucagon-like peptide-1 (GLP-1) receptor agonists. https://www.asahq.org/about-asa/newsroom/news-releases/ 2023/06/american-society-of-anesthesiologists-consensus-based-guidance-on-preoperative; 2023. Accessed August 15, 2024.

64. Goldenberg RM, Gilbert JD, Houlden RL, Khan TS, Makhija S, Mazer CD, et al. Perioperative and periprocedural management of GLP-1 receptor-based agonists and SGLT2 inhibitors: Narrative review and the STOP-GAP and STOP DKA-2 algorithms. Curr Med Res Opin 2025;41:403—19.

65. Nayak PA, Nayak UA, Khandelwal V. The effect of xylitol on dental caries and oral flora. Clin Cosmet Investig Dent 2014;6:89—94.

66. Gorgojo-Martínez JJ, Mezquita-Raya P, Carretero-Gómez J, Castro A, Cebrián-Cuenca A, de Torres-Sánchez A, et al. Clinical recommendations to manage gastrointestinal adverse events in patients treated with GLP-1 receptor agonists: A multidisciplinary expert consensus. J Clin Med 2022; 12.

67. Magalhães AC, Wiegand A, Rios D, Honório HM, Buzalaf MA. Insights into preventive measures for dental erosion. J Appl Oral Sci 2009;17:75—86.

68. Enabulele J, Ibhawoh L. Resident obstetricians' awareness of the oral health component in management of nausea and vomiting in pregnancy. BMC Pregnancy Childbirth 2014;14:388.