

The "Point of Care" section answers everyday clinical questions by providing practical information that aims to be useful at the point of patient care. The responses reflect the opinions of the contributors and do not purport to set forth standards of care or clinical practice guidelines. This month's responses were provided by speakers at the Ontario Dental Association Annual Spring Meeting (www.oda.on.ca), which will be held April 6–8 in Toronto, Ontario.



QUESTION 1

Does tooth bleaching have any adverse effects on enamel and dentin?

Background to the Problem

Tooth bleaching methods generally involve the application of 10% (or higher concentration) carbamide peroxide (CP) or hydrogen peroxide (HP) products to the tooth surface for several hours daily over a few weeks in an at-home regimen and the application of 30% (or higher) HP to the tooth surface for several minutes during a few sessions in an in-office regimen. These regimens can be repeated many times to maintain tooth whitening. A wide range of bleaching products is currently available. In Canada, these products are classified as cosmetics, and there is therefore no specific requirement that their safety and effectiveness be proven. It is important to determine the potential adverse effects of these widely used products, particularly when used repeatedly.

Tooth bleaching treatments have been associated with certain negative effects on dental hard tissues. With regard to enamel and dentin, the research has examined primarily the effects of bleach on bonding of adhesives, surface hardness and surface morphology. Few studies have focused on how bleaching products affect the structural integrity of the dentin.

Effect of Tooth Bleach on Bonding of Adhesives to Enamel and Dentin

Applications of CP and HP in simulated at-home and in-office tooth bleaching protocols drastically reduced the strength of bonding when adhesives were applied to enamel and dentin.^{1–3} The reduction in bond strength is explained by residual HP that remains after the cessation of bleaching, which inhibits polymerization. The reduction in bond strength is reversible, and bond strength increases after 1 week. Therefore, adhesive bonding to enamel and dentin should be delayed until 1 week after a bleaching treatment.

Effect of Tooth Bleach on Enamel and Dentin Surface Morphology and Hardness

Changes to enamel and dentin surface morphology have been described in several studies.^{4–8} A decrease in enamel surface hardness has also been reported.^{9,10} The significance of these changes is questionable, however, since they affect only the outer few micrometres of enamel and may be reversed after exposure to saliva.

Effect of Tooth Bleach on the Structural Integrity of Dentin

Bonding and hardness studies reflect changes to the surface only and do not characterize changes to dentin beyond the surface layers. The structural integrity of the teeth is better determined by strength and fracture toughness studies.

In a recently published study, direct exposure to 10% and 15% CP caused a significant decrease in the flexural strength and flexural modulus of elasticity of bovine teeth.¹¹ This effect appeared to be time related, and there was a greater decrease in mechanical properties after a 2-month period than after a 2-week period of daily bleach application and no difference when the shorter (1 hour daily) application times of HP were used. Chng and others¹² reported significant decreases in the ultimate tensile and micropunch shear strengths of dentin after intracoronal application of 30% HP. In both these studies, the bleach was applied directly to the dentin surface. These studies characterized the structural changes that occur as a result of direct application of bleach to dentin and are relevant to clinical cases of bleaching in which there is dentin exposure, such as occlusal attrition or gingival recession. However, the intended clinical application of bleach is onto enamel, not dentin.

Our laboratory has just investigated the effect of indirect applications (i.e., through intact enamel) of CP and HP on the fracture toughness of dentin.¹³ The in vitro fracture resistance of dentin

was significantly reduced by 17% after daily indirect application of 10% CP for 8 weeks, and by 17% and 37% after daily indirect application of 16% CP for 2 and 8 weeks, respectively. Direct application of the same bleach products to dentin significantly decreased dentin fracture toughness even more. Time (2 vs. 8 weeks) and application mode (direct vs. indirect) were significant factors.

Until the specific cause of reduced dentin structural integrity as a result of bleaching is determined, measures to prevent dentin weakening or to aid in the recovery of dentin fracture resistance after bleaching will remain unknown. Topical fluoride treatment and storage of specimens in artificial saliva for 2 weeks after application of bleach or control material did not affect the flexural strength and modulus.¹⁴

The studies on strength and fracture toughness suggest that caution should be exercised when bleach is applied directly on dentin (e.g., in occlusal attrition or root recession) for prolonged treatment times. ♦

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Dr. Tam's half-day session at the ODA annual meeting, titled "The facts about tooth whitening", will be presented on Thursday, April 6.

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QUESTION 2

What is the best way to use epinephrine in a medical emergency?

Background to the Issue

Other than oxygen, epinephrine is the most versatile and important emergency drug in an emergency drug kit. It can be used in the treatment of allergy, anaphylaxis, asthma, cardiac arrest or hypotension.

In any medical emergency, time is of the essence. Injection is the fastest way to introduce a drug into the whole body. As such, injection is an invaluable route of drug administration when speed matters.

Epinephrine is a sympathomimetic agent that interacts with the α and β receptors of the sympathetic nervous system throughout the body. The effects of epinephrine include an increase in the heart rate, peripheral vasoconstriction (which increases the blood pressure) and bronchodilation.¹⁻³

Intravenous (IV) injections put epinephrine directly into the bloodstream, but if staff members in the dental office are unfamiliar with IV protocols, then intramuscular (IM) injections are the method of choice. Intralingual injection of epinephrine (on the ventral surface of the tongue) is also acceptable but should not be performed with an auto-injector.

Management of the Issue

One of the basic ingredients for successful management of medical emergencies is good preparation of the team. Team members should know that when they face a medical crisis, they should always start with the ABCs of cardiopulmonary resuscitation — airway, breathing, circulation — and then signal for help from the

rest of the team. Once the initial steps of basic emergency management have been performed, the specific problem should be diagnosed. If the situation calls for an epinephrine injection, the injection should be administered and a 9-1-1 call placed.

IM injections of epinephrine can be given in a number of ways. The EpiPen system (Dey, Napa Valley, Calif.; Fig. 1) and the new Twinject system (Verus Pharmaceuticals, Inc., San Diego, Calif.; Fig. 2) are preloaded auto-injectors. Both of these systems contain 0.3 mg of epinephrine for adults. The EpiPen Jr. and pediatric Twinject auto-injectors (for people less than 30 kg [66 lb]) contain 0.15 mg of epinephrine. The least expensive, yet most versatile, method of administering epinephrine is with a manual needle and syringe with glass ampoules of epinephrine at a concentration of 1:1000. There are 2 important points to remember about all 3 of these systems. First, none of the systems is mistake-proof when it comes to



Figure 1: EpiPen auto-injector.



Figure 2: Twinject auto-injector.



Figure 3: Administration of epinephrine into the thigh.



Figure 4: Administration of epinephrine into the shoulder.

administering the drug; second, you must become familiar with whatever system you choose *before* you have to use it.

The best places for an IM injection of epinephrine are the anterolateral aspect of the thigh (Fig. 3) and the deltoid or triceps muscle of the arm (Fig. 4). These areas are easily accessible, the muscles are large and well perfused, and there are few important structures at risk of damage. The injections can be given through clothing. Because of epinephrine's short duration of action (10 to 20 minutes), repeat doses may be necessary if medical support is not promptly available. Repeat doses may also be needed if the patient's symptoms are severe.⁴ The Twinject auto-injector contains 2 doses of epinephrine, and step-by-step instructions are provided on the injector itself. The EpiPen system can be purchased in a package of 2 injectors.

In the dental setting, IV injections of epinephrine should be given only if staff members are familiar with running IV lines. The concentration of epinephrine for IV use should be 1:10000, to avoid localized vasoconstriction that could slow the drug's distribution throughout the body. When administered by this route, adverse effects can be minimized³ by giving the epinephrine in smaller

(0.1 mg) doses or by slow infusion until the desired effect is reached.

In summary, epinephrine is an important drug in the treatment of several medical emergencies. It may be given by the IV, IM or intralingual routes of administration, but familiarity with the drug and the chosen method of delivery are crucial for patient safety. ♦

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Dr. Nkansah's half-day session at the ODA annual meeting, titled "Medical emergencies in the dental office: are you ready?", will be presented on Friday, April 7.

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QUESTION 3

How can I better understand and care for a patient with a mental illness?

Background to the Issue

Psychiatric disease and dental disease are 2 of the most prevalent types of health problems in Canadian society today. Mental illness and the resulting disabilities inflict immeasurable difficulties on patients, their families and their friends, not the least of which is the stigma associated with such conditions.

One in 5 adult Canadians will suffer from some form of mental illness in any given year, and many of these people will not receive treatment until many years after the onset of illness. Thus, every oral health practice can be expected to include patients with some form of mental illness. Many of these patients will appear healthy despite their ongoing emotional disorder. Mental health and oral health are intertwined and can have significant

interactions. The medications used to treat various forms of mental illness may interact with the drugs used in dentistry. Oral health problems can arise as manifestations of mental illness or may occur as side effects of psychiatric medications. Finally, psychiatric disorders often lead to decreased compliance with preventive oral care and decreased ability to obtain or tolerate oral health treatment. The end result can be truly devastating, particularly for younger patients.

Management of the Issue

Dental treatment staff need to become more aware of and sensitive to the vulnerability factors and psychological problems of individual patients and their implications in terms of presenting signs and symptoms and treatment planning.

Table 1 Common psychiatric medications and their impact on dental care

Medication	Oral side effects
Antipsychotics	
<i>Conventional</i>	
Chlorpromazine, haloperidol, perphenazine	Xerostomia, tardive dyskinesia (movement disorders)
<i>Atypical</i>	
Clozapine, olanzapine, quetiapine, risperidone	Xerostomia, dysphagia, stomatitis, dysgeusia
Mood stabilizers	
Lithium	Xerostomia, lichenoid stomatitis, metallic taste
Antidepressants	
<i>Tricyclic antidepressants</i>	
Amitriptyline, clomipramine, imipramine	Xerostomia, possible potentiation of pressor effects of epinephrine in local anesthetics; use of levonordefrin contraindicated; use of retraction cord with epinephrine contraindicated
<i>Monoamine oxidase inhibitors (MAOIs)</i>	
Moclobemide, phenelzine	Xerostomia, possible potentiation of pressor effects of epinephrine in local anesthetics; use of levonordefrin contraindicated; use of retraction cord with epinephrine contraindicated
<i>Selective serotonin reuptake inhibitors (SSRIs)</i>	
Bupropion, citalopram, fluoxetine, paroxetine, sertraline, venlafaxine	Xerostomia, dysgeusia, stomatitis, glossitis, bruxism

Specific concerns in providing treatment might include dealing with patients who have a history of physical or sexual abuse and who may therefore be uncomfortable with the close contact that is inherent in otherwise routine dental procedures. In this situation, a step-by-step description of the procedures that will be done may be required to help the patient relax. A history of substance abuse (seen in over one-third of patients with depression) may result in behavioural problems or early cognitive impairment, which may make it difficult to provide treatment. In addition, the dentist may need to ascertain current liver function status and possible liver disease (e.g., bleeding problems) through consultation with the patient's physician. Eating disorders, particularly bulimia, may lead to enamel erosion, primarily of the lingual surfaces of the maxillary teeth. This problem can present a distinctly sensitive ethical dilemma in the case of a younger patient, particularly if the family is as yet unaware of the disorder. Initiation of dialogue with such patients is a difficult yet important first step to engage their trust and confidence before appropriate referral to a multidisciplinary team (which might include a psychologist, psychiatrist, and nutritionist, among others) in an attempt to end the destructive behaviour. Many patients with mood disorders (e.g., major depression, bipolar disorder) are uninterested in oral hygiene, which contributes to progressive periodontal problems and an increased rate of dental caries. One of the

most frequently reported side effects of antipsychotic and antidepressant medications is xerostomia (Table 1). Various preventive protocols are available for the management of dry mouth, including use of oral moisturizers and saliva substitutes, frequent sipping of water, use of adjunctive fluoride-containing agents (gels, rinses, varnishes or toothpastes) and frequent recall appointments.

With enhanced knowledge of various mental illnesses, the dental treatment team can safely and compassionately contribute to the overall psychotherapeutic management of patients presenting with underlying psychiatric illness. ♦

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Dr. Clark's full-day session at the ODA annual meeting, titled "Depression, anxiety, dementia and dentistry", will be presented on Thursday, April 6.

Further Reading

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QUESTION 4

What topics should I discuss with patients who have both diabetes and periodontal disease, and how will the presence of diabetes affect management of their periodontal problems?

Background to the Problem

There has been an accumulation of data suggesting that periodontal diseases not only affect oral health but might also have a negative impact on systemic health and overall well-being. Several disorders have been linked to periodontitis, and it has been suggested that patients with this condition may be more susceptible to heart disease, stroke, osteoporosis and diabetes mellitus. In fact, there may be a bidirectional relationship between diabetes and periodontitis, such that exacerbation of one can lead to worsening of the other, while treatment of one condition might improve treatment outcomes for the other.^{1,2}

Assessing the Problem

In light of the foregoing, patients and clinicians face several questions relating to the interactions between periodontitis and diabetes and the management of the 2 conditions when they present concurrently.

Is there a relationship between gum disease and diabetes?

Yes, there is a relationship between these conditions, and it seems to go in both directions. That is, if a patient has diabetes, he or she is at greater risk of periodontal disease; conversely, if a patient already has gum disease along with diabetes, the gum disease may be more severe than if he or she

did not have diabetes. Furthermore, treatment of periodontal disease is more difficult in a patient who has poorly controlled diabetes.

What would make you suspect that a patient has diabetes?

If a patient has been seen in your practice for years and has never had periodontal problems, or has had only minor periodontal problems that have quickly become more severe (Fig. 1), you should suspect a systemic condition, such as diabetes. Suspecting diabetes is even more important if the patient smokes, since smokers who have diabetes are at the greatest risk for periodontal problems. If the patient has gained weight or has other symptoms (polyuria, for example), it might be wise to mention the possibility of diabetes and suggest that this be assessed by the patient's physician.

What if the patient tells me that he or she has diabetes that is "under control," but I still have strong suspicions that it's not under control, given worsening of a periodontal condition?

In this situation, you should ask the patient to see his or her physician to determine whether glucose is in fact being controlled effectively. One of the most reliable tests of glucose control involves determining the level of glycated hemoglobin (hemoglobin A1c). Glycated hemoglobin (Fig. 2) is a protein formed by reaction of amino acid side chains with glucose molecules, particularly during periods when serum glucose is high. Glycated hemoglobin has a long half-life in serum. For a patient with "borderline" diabetes, a random blood sugar measurement might be normal. However, if the patient has relatively short peaks of high blood sugar, more hemoglobin A1c will be formed and will stay in the blood for several weeks. Hence, measurement of hemoglobin A1c gives a more accurate assessment of the patient's sugar control than random measurement of blood glucose levels. You or the patient can request this test when talking to the patient's physician.



Figure 1: Photograph of a patient with diabetes and periodontitis. Although there are obvious local factors, this patient's condition is undoubtedly related to worsening of glycemic control, and hence, elevated levels of glycated hemoglobin.

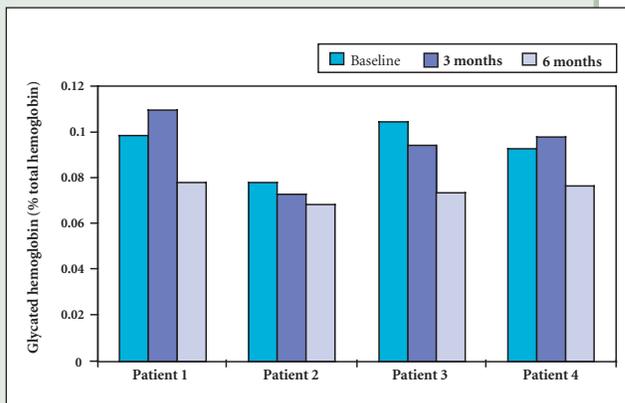


Figure 2: Preliminary data from an in-office research program shows reduction in glycated hemoglobin levels after periodontal therapy in the 4 patients treated to date.

Does treatment of periodontal disease in a patient with diabetes have any effect on the diabetes?

Yes, there is now ample evidence that elimination of periodontitis will lead to improvement in glucose control, with concomitant improvements in hemoglobin A1c.³ Even minor reductions in hemoglobin A1c can lead to dramatic reductions in many of the more severe but late complications of diabetes including blindness, kidney disease, high blood pressure and cardiovascular disease.⁴ In fact, it is a good idea to confer with the physicians with whom you work, suggesting that if a patient with diabetes is having trouble with blood sugar control, a full dental examination might be warranted.²

Preliminary findings of a double-blind, randomized study carried out by one of the authors (MG) have also confirmed that glycated hemoglobin levels can be reduced following treatment of periodontitis. These results were obtained in patients treated with scaling and root planing plus metronidazole (vs. a placebo). Metronidazole, unlike doxycycline, does not interfere with protein glycation. The reductions in glycated hemoglobin

levels were therefore attributed to improvements in diabetes parameters and reductions in the indicators of periodontal disease as opposed to drug-mediated inhibition of protein glycation.

Does treatment of diabetes lead to improvements in periodontal health?

There is also good evidence that when diabetes is well controlled, the patient's periodontitis can be treated much more easily. In some cases, the periodontitis will almost resolve on its own, with only minor intervention, once the diabetes has been controlled. ♦

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Dr. Tenenbaum's half-day session at the ODA annual meeting, titled "The link between oral and systemic health: periodontal disease and the compromised patient", will be presented on Friday, April 7.

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