

Point of Care

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 Annual Spring Meeting of the Ontario Dental Association, to be held May 5–7, 2005, in Toronto, Ontario.



Question 1 A patient of mine has reported that she is “allergic to freezing.” What are the causes of local anesthetic-related allergies?

Anesthetic-related allergies, even mild ones, constitute less than 1% of medical emergencies in the dental office. Nonetheless, it is important to understand which substances within a local anesthetic solution are possible allergens and to determine the source of a patient's allergic reaction.

Local anesthetics are classified as esters or amides. Today, all injectable local anesthetics used in dentistry are amides (Box 1). A wide variety of esters and amides are available as topical anesthetics, for example, benzocaine (an ester), tetracaine (an ester) and lidocaine (an amide).

If a patient is allergic to an ester-based anesthetic, the allergen is not the anesthetic itself but a breakdown product, *p*-aminobenzoic acid (PABA), which is generated on metabolization of any ester. Therefore, if a patient is allergic to one ester-type local anesthetic, he or she will be allergic to all such anesthetics. The same is not true for amides, which break down into a variety of metabolites; thus, allergy to one amide should not preclude the use of another, unless testing reveals an unusual situation of multiple amide allergies. In fact, allergy to any amide-type local anesthetic is extremely rare, although some cases have been documented.¹ If a patient demonstrates an allergy to the contents of an amide-based anesthetic cartridge, the likely culprit is the preservative for the vasoconstrictor, sodium metabisulphite. Such patients might report sulphite allergy in their medical history. They are typically sensitive to any products that contain sulphite preservatives (Box 2). This type of allergy is not the same as a sulpha allergy, which is an allergy to a class of antibiotics called sulphonamides. People with sulpha allergies do not demonstrate cross-sensitivity to sulphites. Therefore, if a patient is allergic to sulphite preservatives but not to the local anesthetic itself, he or she can safely tolerate a solution with no vasoconstrictor. The incidence of sulphite allergy is higher among allergy-prone asthmatic patients than among nonasthmatic patients.

At one time a bacteriostatic agent called methylparaben was available in dental anesthetic cartridges.

Box 1 Injectable local anesthetics available in Canada

Drug	Available as plain solution
Articaine	No
Bupivacaine	No
Lidocaine	No
Mepivacaine	Yes
Prilocaine	Yes

Box 2 Foods that contain sulphite preservatives

- Salads served in salad bars
- Dried fruits
- Alcoholic drinks
- Potato chips
- Deli meats
- Pickles
- Cheese
- Lemon and lime juices, some other fruit juices
- Gelatin
- Muffin mix
- Canned and dried soups
- Canned fish
- Cider and vinegar

Methylparaben is also metabolized to PABA, so it was a potential allergen. This product is needed only in multidose vials and is no longer available in dental cartridges.

When there is a question as to the cause of an allergy, the patient should be sent to an allergist. The dentist should request testing for a few different anesthetics and for the preservative sodium metabisulphite. It is also a good idea to give the patient a variety of anesthetic samples to take to the allergist, including a solution that does not contain vasoconstrictor.

There is also the possibility of allergy to the latex within the cartridge. Latex particles can enter the cartridge after the needle perforates the diaphragm or via the plunger (in some cartridges). However, it is unlikely that latex within

the cartridge can induce latex hypersensitivity, as there are no published reports of an allergic response to the latex component of a dental cartridge.² In any case, companies are now moving toward use of latex-free components.

If a patient reports an allergy to a local anesthetic, it is of paramount importance to determine the events that led to the report. Sensitivity to epinephrine or an intravascular injection commonly leads to misinterpretation of the reaction as an allergy. Affected patients may experience symptoms such as palpitations, sweating, nausea, and a feeling of faintness, and some might call this an allergic reaction. Another clinical situation that can be mistaken for an allergic reaction is an overdose of local anesthetic. In this situation, the patient may demonstrate a range of signs and symptoms, including a feeling of discomfort, tingling, metallic taste, confusion, talkativeness, hypertension and increased pulse. In more extreme overdose situations,

seizures and coma may occur. Allergies do not typically present in this way. Patients must be counselled on the differences between allergic reactions and the symptoms of overdose and epinephrine-induced reactions. ♦



Dr. David Isen maintains a private practice in Toronto, Ontario, where he treats patients who require advanced anesthetic care. He has lectured extensively on topics related to local anesthesia, medical emergencies and nitrous oxide sedation. E-mail: d.isen@rogers.com.

Dr. Isen's session at the ODA meeting, titled "Advanced local anesthesia - what you need to know," will be presented on Thursday, May 5.

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Question 2

What should I know about treating dental patients who are undergoing chemotherapy and when is it the best time for dental treatment?

Background

The Canadian Cancer Society estimates that 145,500 Canadians will develop cancer during 2004 and that 68,300 cancer-related deaths will occur. The management of many malignancies includes the use of chemotherapeutic drugs. As these treatments have become more intensive and therapeutically successful, the complications have increased. The mouth is a frequent site of such side effects. In chemotherapy, most complications are the result of immunosuppression, myelosuppression and direct cytotoxic effects on oral tissues (Figs. 1 to 3). Oral complications in chemotherapy patients are usually acute and subside shortly after the chemotherapeutic drugs leave the system. Such side effects include mucositis, infections, hemorrhage, xerostomia and neurotoxicity. Mucositis, the most common acute oral complication of chemotherapy, typically appears 5 to 7 days after the start of treatment (it may appear as early as 3 days after initiation of cancer therapy). Unfortunately, most chemotherapeutic drugs affect normal tissue as well as the neoplastic cells and tissues. It is this lack of specificity in the majority of current therapies that contributes to the wide range of oral complications.

It is important to determine the cytotoxic, immunosuppressive and myelosuppressive nature of a chemotherapeutic regime. A cytotoxic drug will induce mucositis, whereas an immunosuppressive drug will allow microorganisms to flourish, putting the patient at high risk for periodontal

and odontogenic abscesses as well as viral and fungal infections. A myelosuppressive drug complicates treatment by reducing platelet counts, making emergency surgery and routine oral hygiene dangerous.

Most chemotherapy regimens for cancer comprise a combination of drugs. It is therefore not unusual for a patient to experience both mucositis and immunosuppression. This type of regimen may leave the patient extremely susceptible to opportunistic infections.

Dental Management of Cancer Patients

The most logical time to perform dental treatment for a cancer patient is before the patient's cancer therapy begins. Most of the cancer patients who are treated in a dental oncology clinic, however, are seen on emergency referral from the oncologist or the dentist and are undergoing active chemotherapy. Most dental emergencies during active chemotherapy could be avoided through a prechemotherapy intraoral examination and a thorough periodontal cleaning and appropriate mouth care. Thus, it is unfortunate that few oncologists recommend to their patients that they seek treatment from the family dentist before chemotherapy commences.

During cancer chemotherapy, dental treatment should be undertaken only on an emergency basis. Such treatment may include periodontal cleaning, if the patient's hygiene has been neglected and he or she has active periodontal disease. Therefore, such emergency treatment involves any



Figure 1: Secondary bacterial and fungal infections caused by chemotherapy-induced mucositis.



Figure 2: *Candida albicans* infection caused by the xerostomic and immunosuppressive effects of chemotherapy agents.

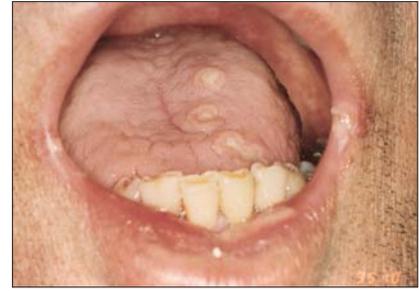


Figure 3: Herpes simplex virus on the dorsum of the tongue and *C. albicans* on the commissure of the lips caused by the immunosuppressive effects of chemotherapy.

dental treatment required to remove a source or potential source of infection. The practice guidelines listed below are appropriate and safe for any general practice dentist treating a patient who is undergoing cancer therapy. As for any situation, the dentist's judgement should be based on his or her own comfort zone.

1. Dental treatment should be undertaken only after consultation with the patient's oncologist or a dental oncologist (if there is one in your area), to coordinate the dental treatment with the patient's optimal hematological status.
 - White blood cell count must be greater than $1.0 \times 10^9/L$.
 - Platelet count must be greater than $40 \times 10^9/L$ and the international normalized ratio must be normal.
 - Antibiotic prophylaxis is required when the absolute neutrophil count is less than $2.0 \times 10^9/L$.
 - Patients with indwelling catheters (also called central venous catheters or Hickman lines) require prophylactic antibiotic coverage.
2. The optimal time to perform dental treatment is just before a cycle of chemotherapy begins, to maximize the time before the patient's condition reaches a nadir.
3. At any time, symptomatic teeth with pulpal involvement can be opened, debrided and closed with a temporary restoration.
4. Decay can be excavated and sedative fillings placed anytime during chemotherapy treatment.
5. Generally, extractions are contraindicated except in extreme emergencies (i.e., when an infected tooth may be the source of systemic infection).

6. A nonflavoured, nonalcohol 0.12% chlorhexidine rinse should be prescribed for use 4 times daily and up to every 2 hours in the event of oral mucositis. Because there are no clinical practice guidelines for the treatment of chemotherapy-induced mucositis, chlorhexidine is used at our cancer centre to treat this condition.
7. Petroleum products should be avoided in the treatment of dry, cracked lips; instead, lanolin should be recommended. ♦



Dr. Deborah Saunders is head of the dental oncology program at the Northeastern Ontario Regional Cancer Centre in Sudbury, Ontario. E-mail: dsaunders@hrsrb.on.ca.

Dr. Saunders' session at the ODA meeting, titled "Dental care for the cancer patient," will be presented on Friday, May 6.

Further Reading

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Question 3 What are the choices of antibiotics for the treatment of acute odontogenic infections?

Background

The complexity of the oral and dental flora has prevented clear elucidation of specific causative agents in most forms of odontogenic infections. Anaerobic bacteria, which are part of the normal oral and dental flora, represent at least 350 morphological and biochemically distinct bacterial groups.¹

Most odontogenic infections result initially from the formation of dental plaque and continue to develop in areas of tissue damage or trauma. Dental caries, periodontal disease, pericoronitis and postsurgical wounds are common factors in odontogenic infections. Once pathogenic bacteria become established, they can cause a wide variety of local and disseminated complications. The most common infections include dentoalveolar infections, gingival infections, and periodontitis. These can be categorized as localized infections (such as acute periodontal abscesses), spreading infections (such as early cellulitis and infections with deep space involvement) and life-threatening infections (such as necrotizing fasciitis and Ludwig's angina).²

Odontogenic infections are generally caused by mixed aerobic and anaerobic polymicrobial bacteria from the same families of oral microorganisms (obligate anaerobes and gram-positive aerobes). The microorganisms recovered from infections generally reflect the host's indigenous oral flora. Therefore the choice of antibiotic to treat odontogenic infections must be made according to the polymicrobial nature of such infections and local resistance patterns.

In all instances of odontogenic infections it is essential that the airway be assessed and secured if necessary, as the initial life-saving manoeuvre. If there is an abscess to be drained or necrotic tissue requiring removal or debridement, this must also be done.^{2,3} Attention can then turn to antibiotic choices. One common mistake is the tendency to underdose the antibiotic, which is assumed to be one of the causes of antibiotic treatment failures.⁴ Practitioners must be aware of the appropriate pediatric and adult dosages of antibiotics that are useful in odontogenic infections⁴ (Box 1). Moreover, the course of the infection must be monitored continuously both clinically and by following the results of culture and sensitivity testing. Widespread resistance of pathogens is another important cause of antibiotic treatment failures. General practitioners must be prepared for early referral of such cases to a specialist if the

Box 1 Antibiotic choices and dosages for dental practitioners treating acute odontogenic infections

Antimicrobial drug	Adult dosage	Pediatric dosage
Penicillin V	600 mg 4 times a day	30–50 mg/kg per day in 4 divided doses
Amoxicillin	500 mg 3 times a day	20–50 mg/kg per day in 3 divided doses
Amoxicillin–clavulanate	500/125 mg 3 times a day	40/10 mg/kg per day in 3 divided doses
Metronidazole	500 mg 3 times a day	15–30 mg/kg per day in 3 divided doses
Clindamycin	150–300 mg 4 times a day	10–30 mg/kg per day in 3 divided doses
Ciprofloxacin	250–750 mg twice a day	40 mg/kg per day in 2 divided doses

infection is not responding to treatment, especially if there are any airway or neurological concerns.

Choice of Antibiotics

The gold standard first-choice antibiotic has historically been penicillin for patients not allergic to this drug. Phenoxymethyl-penicillin, or penicillin V, can be used to treat the vast majority of odontogenic infections. It is more resistant to gastric acids than its predecessor, penicillin G, and it is very well tolerated orally. However, resistant bacterial species, particularly those that elaborate β -lactamase, have made the treatment of odontogenic infections more complex and difficult. Amoxicillin has a spectrum similar to penicillin, and its effectiveness against *Haemophilus influenzae* can be useful. Amoxicillin can also be effective against bacterial species that produce β -lactamase if combined with clavulanic acid. Diarrhea may be one major side effect of the amoxicillin–clavulanate combination. Cephalosporins offer no major advantages over the penicillins and are much more expensive.

Although penicillin is still a good first choice today, its spectrum of activity may need to be augmented. One possibility is metronidazole, a bacteriostatic agent that is highly active against most anaerobes but which has poor coverage of aerobic species. Metronidazole should never be used on its own to treat an acute odontogenic infection. The use of metronidazole may not be entirely benign, and side effects may occur; for example, metronidazole may cause an Antabuse-type reaction if combined with alcohol, and peripheral neuropathies have been reported.

Erythromycin and tetracycline have limited application in dentistry. Erythromycin is a bactericidal antibiotic with a poor performance record in odontogenic infections. There are serious compliance issues because of the intense nausea and vomiting that this drug can cause. When given intravenously, erythromycin tends to be extremely irritating to the veins. The usefulness of tetracycline has been diminished by widespread resistance.

Clindamycin is the drug of choice for patients with a history of penicillin allergy. Clindamycin has the advantage of reliable coverage against gram-positive aerobic and anaerobic bacteria, with the possibility of attaining high intra-bony levels with both intraoral and intravenous administration. The biggest disadvantage of clindamycin is its association with pseudomembranous colitis. The 2 groups at greatest risk appear to be elderly patients and patients who have recently had long-term hospital stays and are therefore at risk for nosocomial (hospital-acquired) infections. The incidence of clindamycin resistance also seems to be increasing.

Ciprofloxacin may be one other antibiotic to consider. Like the other fluoroquinolones, this unique fluoroquinolone antibiotic has potent gram-negative activity inhibiting DNA gyrase and topoisomerase IV.⁵ Ciprofloxacin is also

effective against gram-positive organisms and may be used together with clindamycin. ♦



Dr. George Sándor is an associate professor and director, graduate program in oral and maxillofacial surgery and anesthesia, University of Toronto, and is the coordinator of oral and maxillofacial surgery at The Hospital for Sick Children and Bloorview MacMillan Children's Centre, Toronto, Ontario, and docent in oral and maxillofacial surgery, University of Oulu, Oulu, Finland. E-mail: george.sandor@utoronto.ca.

Dr. Sándor's sessions at the ODA meeting, titled "Keeping general practitioners out of trouble when performing dento-alveolar surgery" and "The ever changing face of odontogenic infections," will be presented on Friday, May 6.

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Question 4

I use oral sedatives in my office for children and anxious patients. Should I use pulse oximetry?

Like all drugs, sedatives produce a range of effects depending on patient factors. In most patients, mild anxiolysis or light sedation results, but at the other end of the spectrum (in rare cases) a near catatonic state can occur. Sedatives can cause a patient to become unresponsive, which can lead to hypoventilation or an inability to maintain the airway. Luckily, standard benzodiazepines, alcohols and hypnotics have a wide therapeutic margin and are generally safe. So safe, in fact, that current Royal College of Dental Surgeons of Ontario guidelines do not require pulse oximetry or other mechanical monitors when these drugs are given as a single agent by mouth. However, if a practitioner chooses a mechanical monitor during single-agent sedation, a pulse oximeter is an excellent first choice.

What Does a Pulse Oximeter Do?

Pulse oximeters measure the level of oxygen in the blood. Oximetry is generally accurate, non-invasive and sensitive to changes in hypoventilation. The oximeter, which is attached to the patient's finger using a small clip, shines a light through the nail bed and measures the ratio of oxygenated to deoxygenated hemoglobin (Fig. 1). This measurement is calculated continuously and averaged over 5-60 seconds,

depending on the machine settings. This means that changes in the amount of oxygen in the blood will be seen on the oximeter as soon as the value is calculated.

When a patient loses consciousness to the point that he or she is unable to maintain the airway, breathing stops. The level of carbon dioxide in the blood rises, creating the urge to breathe that one normally feels when holding one's breath. As minutes tick by, oxygen dissociates from heme molecules in the red blood cells and is used by the body. At first, the amount of oxygen in the blood drops slowly (Fig. 2), but as hemoglobin releases oxygen, oxygen's affinity for the heme molecule decreases and it is released ever more quickly. To the clinician, this is important because the drop in a patient's oxygen saturation from 100% to 90% is relatively slow (usually minutes), but the drop from about 85% to 10% is very rapid (usually seconds). At the point where this acceleration begins, the patient will appear blue (cyanotic) and the problem becomes quickly apparent. If oxygen saturation remains low for more than 4-6 minutes, death will result. The bottom line is that oxygen saturation below 85%, in a sedated patient, must be treated immediately to prevent dire consequences.



Figure 1: Oxygen saturation monitor with finger clip (the patient is breathing room air and oxygen saturation is 98%).

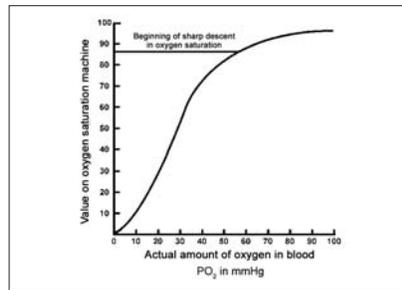


Figure 2: The oxygen dissociation curve showing steep drop of 85% on the vertical axis.



Figure 3: If a patient has an oxygen saturation of 37% (critically low), ventilate using a bag-valve mask and 100% oxygen.

Practical Use of an Oximeter

The good news is that the body has a certain store of oxygen, so the drop in oxygen can be measured and the process reversed before the results become permanent. If a patient is on an oximeter and oxygen saturation begins to fall, basic steps can usually reverse the problem (assuming it is related to excessive sedation).

1. If the patient is conscious, tell him or her to take some deep breaths.
2. If the patient is conscious, give supplemental oxygen with a mask.
3. If the patient is unconscious, try to rouse him or her, then open the airway.
4. If the airway is patent, use a bag-valve mask (BVM) with supplemental oxygen.
5. If the patient is unconscious but breathing, “assist” the breaths with the BVM until oxygen saturation is 96% or more; if the patient is not breathing, give 1 breath every 5 seconds until that saturation level is reached (Fig. 3).
6. Consider a reversal agent (flumazenil for benzodiazepines or naloxone for narcotics) to wake the patient.

Like all pieces of equipment, the pulse oximeter can give inaccurate readings. The most common reasons for a false low value are movement, cold fingers (causing inadequate peripheral circulation for accurate measurements) and nail polish. If your office conducts sedation, consider a pulse oximeter and take the following steps:

- Carefully read the manual to learn over how long a period the values are averaged, how to maintain the equipment and how long the battery will last without power.
- Ensure that support equipment (supplemental oxygen) is readily available, familiar to all staff and well maintained.

- Run office emergency drills to practise dealing with some of the situations listed above.
- Ensure that the protocols you use and the drugs you give are in accordance with the provincial guidelines.

A pulse oximeter is an inexpensive, easy-to-use piece of equipment to monitor patients accurately during any level of sedation. Using it can increase the margin of safety with sedated patients and provide an extra measure of comfort to the staff providing care. ♦



Dr. Ian Furst is an oral and maxillofacial surgeon with the Coronation Dental Specialty Group and staff surgeon at Cambridge Memorial Hospital, Cambridge, Ontario. He is president of the Ontario Dental Society of Anaesthesiology. E-mail: ifurst@cdsg.ca.

Dr. Furst’s session at the ODA meeting, titled “Anesthesia and anesthetics in a general dental practice,” will be presented on Thursday, May 5.

Further Reading

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