JOURNAL OF THE CANADIAN DENTAL ASSOCIATION

JCDA

June 2007, Vol. 73, No. 5

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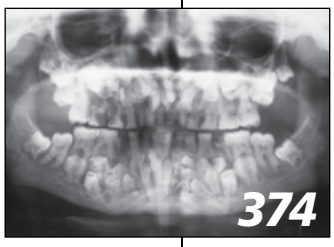

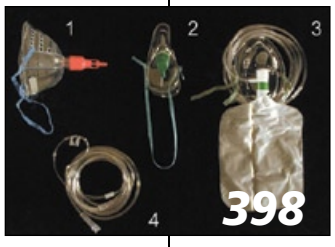

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††Rinse full strength with 20 mL for 30 seconds twice a day.

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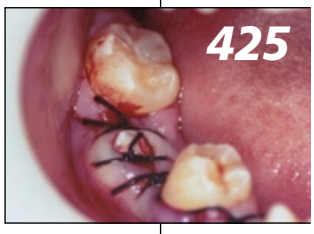

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Reference: 1. van der Weijden GA, Rosema NAM, Versteeg PA, et al. Different modes of oral hygiene to prevent plaque and gingivitis. *J Dent Res.* 2006;85 (special issue B). Abstract 2266.

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Dr. John P. O'Keefe

Important News for Canadian Dentistry

In early April, I received one of the most encouraging letters to come my way as editor-in-chief. The letter was from the manager of publisher relations with Thomson Scientific informing me that *JCDA* has been chosen for indexing in a number of Thomson Scientific databases, including *Journal Citation Reports*.

> "Thomson Scientific has recognized our national flagship publication as being one of the most significant and important journals in the field of dentistry."

This letter is particularly good news because it indicates that Thomson Scientific has recognized our national flagship publication as being one of the most significant and important journals in the field of dentistry. While there is no perfect measure of the quality of scientific publications, I believe that indexing in *Journal Citation Reports* is the best existing measure of quality.

Each year *Journal Citation Reports* publishes an "impact factor" for each indexed publication. This is a measure of how often articles published in a particular publication are cited by authors in significant journals. Many potential authors ask if *JCDA* has an impact factor and tell me they will only submit to a publication that has one. Over time, as our impact factor rises, *JCDA* should be able to attract more and more top-quality papers.

The last time *JCDA* was indexed in *Journal Citation Reports* was in 1977. We have tried 3 times to get *JCDA* back into *Journal Citation Reports* and were informed on the first 2 occasions that our journal wasn't publishing enough original or important material to warrant inclusion in the database.

Of the 49 journals currently included in the dentistry/oral surgery/oral medicine category of the *Journal Citation Reports* database, the majority are specialty publications, or journals with a heavy emphasis on research. In the 2005 edition, there are only 4 publications sponsored by national dental associations: American, Australian, British and Swedish. To me, this indicates that knowledge transfer publications, often primarily aimed at a generalist readership, have little chance of being included in this elite club of more "scientific" publications.

The opening for *JCDA*'s third attempt at consideration for inclusion presented itself when Thomson Scientific began indexing electronic publications. This coincided with the adoption of our current strategy of publishing complementary print and electronic versions of *JCDA*. The print version is designed to be a knowledge transfer publication aimed at Canadian dentists, while the electronic version is designed to be the more scholarly version. One part of this strategy is to publish the full text of a research paper only in the electronic version of *JCDA*, while its abridged version is published in the print version.

Notwithstanding getting indexed in *Journal Citation Reports*, we maintain an unwavering commitment to publish pertinent, accurate, concise and timely articles that appeal to the various professional needs of practising dentists. Our complementary print/electronic strategy allows us to exploit the best features of both media to reach readerships with different interests within Canada and around the globe.

One area of focus for our print journal is coverage of news items that are essential reading for Canadian dentists. I draw your attention to 3 news items in particular in this edition: those about the new American Heart Association guidelines on prophylactic antibiotics for the prevention of infective endocarditis; the American Association of Oral and Maxillofacial Surgeons position paper on bisphosphonate-related osteonecrosis; and the recent patient-to-patient transmission of hepatitis B in a dental office in the United States.

Obeying the old maxim that good journalism tells readers what is happening and explains what it means, *JCDA* asked 3 of our editorial consultants to provide commentaries explaining the significance of these new developments. I believe that Drs. Joel Epstein, Kevin Lung and George Sándor provide value to our readers with their insightful commentaries. The significant contributions of our editorial consultants and associate editors continue to improve *JCDA*, which is good news, indeed, for our profession.

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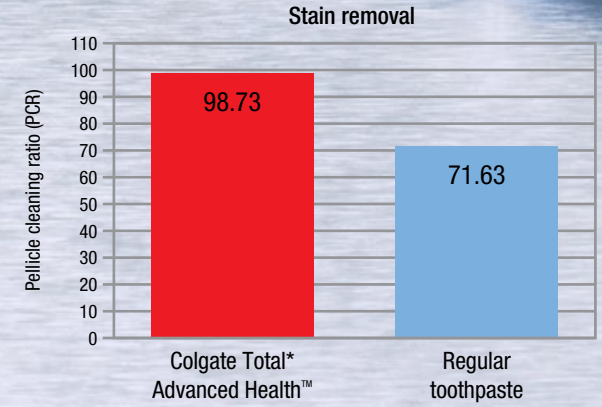

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References: **1,2.** Data on file, Colgate-Palmolive. **3.** Relative Dentin Abrasion (RDA) is below ISO standard for daily use toothpaste. **4.** Amornchat C *et al. Mahidol Dent J* 2004; 24: 103–112. **5.** Panagakos FS *et al. J Clin Dent* 2005; 16(Suppl): S1–S19. **6.** Davies RM *et al. J Clin Periodontol* 2004; 31(12): 1029–1033.

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Dr. Darryl Smith

Essentials of Practice

> "Your success in dentistry did not happen by accident. Are you doing your part?"

A week into the position as president of CDA and I found myself in Toronto, strolling down the aisles of the trade show at the Ontario Dental Association Annual Spring Meeting. Everything needed for a modern dental office was available. The continuing education program provided information on the latest in treatment options and management of a dental practice. Surrounded by so many supplies and services, I was struck by the question, what does a modern dental office require? As I went to lunch with one of the many volunteers who put on such a great meeting, I thought deeply about this question. I arrived at the answer that knowledge and human resources are the absolute essentials of a dental office — the rest are only tools.

There are 2 components to knowledge: transfer and creation. Knowledge transfer occurs at our universities and continues throughout our career. But before there can be knowledge transfer, there must be knowledge creation. Knowledge creation takes place within our universities and the broader research community. Our universities are the key to knowledge, but they find themselves under great pressures that range from a lack of qualified educators to insufficient funds for research and operation.

We have a professional and community responsibility to support research endeavours in dentistry. We can lend a hand by participating in university fundraising programs and through charitable giving. Charitable giving is part of the reality of funding programs today, as governments and industry no longer give unless they see others stepping up to the plate.

In particular, there are 2 important areas that deserve your support: your university alumni association and your charity, the Dentistry Canada Fund. The objectives of both these institutions work in tandem. According to the Dentistry Canada Fund's website, their "Oral Health – Good for Life"™ campaign "will produce outcomes and strategic investments that benefit everyone involved in the chain of oral health care delivery in Canada." The act of giving extends to you and your practice because the next breakthrough in clinical research, the individual who purchases your practice and the teacher who trains your daughter or son will all be the results of how successfully the profession, in partnership with our universities, is able to keep abreast of the needs of Canadians.

Human resources are the other dentistry essential. I could fill pages on this topic but want to focus on volunteers. Dentistry has its share of volunteers, from those providing care to the underprivileged, to those working on your behalf at the society, association and college levels. We are able to provide optimal care to our patients because volunteers take time out of their busy schedules to work tirelessly on our behalf, finding seamless solutions to a myriad of issues that might otherwise be disruptive to our everyday practice.

We have a responsibility to give to our universities and charities and to belong to our local, provincial and national associations. By supporting them, we are supporting those working on our behalf to create a better future for Canadians. It takes cooperation between all of our dentistry organizations and associations working from different perspectives on the issues affecting our profession and the health of Canadians to develop policy and direction that serve everyone well. I must praise our neighbours to the South who saw in their wisdom that to be part of the dental profession, you must belong to your local, state and national associations. Is this too much of a dream to ask of Canadian dentists?

As the sales rang up on the trade show floor, I was mindful of the ever-present question of the cost and value of giving and belonging. Perhaps organized dentistry has done too well at creating seemingly calm seas in a time that has actually been filled with storm. The next time you find yourself on a trade show floor, in a lecture hall, or sitting on a deck with a gentle summer breeze in your face enjoying what Canada has to offer, remember that your success in dentistry did not happen by accident. Are you doing your part?

Darryl Smith, BSc, DDS
president@cda-adc.ca

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The Environment as a Criterion for Selecting Dental Materials

Dentists consider many criteria when selecting dental restorative materials: physical properties, esthetics, durability, cost, ease of placement, and needs and preferences of patients. For many years, amalgam was the material of choice for most circumstances, particularly for posterior teeth.

In the last decade, ecologists and governments have been increasingly concerned about the mercury content of dental amalgam that will eventually end up in the environment. Since signing a Memorandum of Understanding with Environment Canada in 2002, CDA has actively sought the cooperation of dentists in implementing best management practices and installing amalgam separators in their offices to reduce the mercury content in wastewater.

Environment Canada is presently reconsidering its risk management strategy for mercury-containing products.[1] Almost all mercury compounds are toxic and can be harmful even at very low levels in both aquatic and terrestrial ecosystems. Human exposure to mercury can cause brain, nerve, kidney and lung damage. Children exposed to mercury while in the womb can experience developmental difficulties.[1] One recent study concluded that "for every 1,000 lbs of mercury liberated in the environment, there is a 43% increase in the need for special services education and a 61% increase in the rates of autism."[2]

The Canadian dental profession is responsible for about 11,000 lbs of mercury use annually.[1] Since most Canadian dental offices are still not equipped with an amalgam separator, most of the mercury used in amalgam will eventually end up in the environment.

Consider the fact that every amalgam bearer excretes an *average* of 0.1 mg of mercury par day in his or her feces.[3–5] If one assumes that 75% of the population in Canada has dental amalgams, that amounts to over 5,000 lbs of mercury being dumped into the environment daily. This source may be active for more than 50 years after the last amalgam has been placed in a tooth.

Yes, amalgam is cheap and easy to use. If alternatives were not available it would be important to continue its use. But what price must society pay for treating the effects of pollution caused by continued amalgam use in 2007?

Alternatives to amalgam seem to represent a considerably lower environmental problem and, therefore, a lower risk to public health. Several good alternatives to amalgam are currently available to dentists. Although no single alternative can replace amalgam for all its indications, together the alternatives can cover all indications.

Sweden and Norway, as well as the State of Vermont, are presently studying legislation to ban amalgam for environmental reasons as early as 2008. Amalgam use is declining rapidly in favour of more esthetically pleasing alternatives. Over 50% of North American dentists have totally abandoned it for various reasons.[6]

It's only a question of time before we retire amalgam. In the meantime, we have the responsibility to educate our patients and guide them in selecting more environmentally friendly restorative materials for the better health of their children and future generations.

Dr. Pierre Larose
Montreal, Quebec

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Response from CDA

Dr. Larose brings attention to the environmental and health concerns regarding dental amalgam waste and mercury exposure. CDA is addressing these issues by working with Environment Canada in the implementation of the Canada-wide Standard (CWS) for Mercury. As applied to dentistry, the CWS is the application of best management practices to achieve a 95% national reduction in mercury released in the environment from dental amalgam waste starting from the year 2000. Currently, CDA is supporting a dental amalgam survey being conducted by Dr. Philip Watson of the University of Toronto. This survey was also conducted in 2002 and will measure the progress of dentistry in voluntarily achieving the national goal.

Regarding health concerns, CDA is aware that dental amalgam, like any other restorative material, may not be suitable for all patients in all circumstances. For this reason, CDA

recommends a common sense approach to the selection of restorative materials, whereby patients discuss their specific circumstances with their dentist and choose the most appropriate material for a particular application.

CDA is committed to health promotion and the protection of the environment and is working with both government and the dental profession to do so.

Dr. Euan Swan
Manager, Dental Programs
Canadian Dental Association

Tooth Regeneration — An Alternative to Implants in the Future

I came across a radiograph of a patient with cleidocranial dysostosis who had 84 teeth (**Fig. 1**), and it made me wonder whether scientists can regenerate teeth. Will patients ever have the option of getting a natural tooth as a replacement instead of an implant or a denture?

Figure 1: This patient with cleidocranial dysostosis has 84 teeth.

Perhaps this will be a possibility one day. With the success of the human genome project and the identification of almost 300 genes that are responsible for tooth development,[1] scientists may be able to regenerate teeth. If specific genes are manipulated at their target sites, then they could actually regulate the epithelial mesenchymal interactions and initiate odontogenesis on demand. The question that comes to mind is: will the human jaw be able to support new teeth? I believe so, if jaws can support 84 teeth.

In cleidocranial dysostosis, loss of heterozygocity of transcription factor *Runx 2* may be responsible for the development of supernumerary teeth as part of the third dentition.[1,2] What we need to learn is how to modify expression of these genes and transcription factors to regulate tooth regeneration.

Some stem cell researchers think tooth regeneration can be a possibility, and initial results suggest that roots can be regenerated (although obtaining exact crown morphology may be difficult). If we can shape metal crowns with computer-aided design and manufacturing (CAD–CAM), then why not a natural tooth?

Who would have thought of cloning or tissue culture a century ago? It's a reality now. Perhaps in future dentists will be able to replace a missing tooth with a natural tooth and will not depend only on metal implants and dentures.

Dr. Ajit Auluck
Mangalore, India

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Commentary from Dr. Sándor

At first glance many readers might simply react to Dr. Auluck's letter by saying, "I have seen tooth transplantation come and go and tooth regeneration is so many years away that it is simply not practical." In fact there have been great strides and discoveries made in the area of tooth regeneration by leading Finnish scientists such as Professor Irma Thesleff in Helsinki. The gains have been in 2 complementary areas, genetics and stem cell research. The genetic characterization of the complex interactions involved in odontogenesis has provided us with a genetic map of the loci of many of these processes. The other area of progress has been in the understanding of the role of stem cells in these processes. While there will be many details to learn and perfect, such as the production of teeth with the right morphology to fit a particular patient and their occlusal relationships, a modifiable blueprint for these processes is emerging.

While the art and science of dental implant placement and restoration has emerged as an extremely predictable and reliable part of dental treatment today, the future genetic or stem cell morphing of de novo teeth may offer a viable alternative. Even if these possibilities are all things of the future, it is good for us to dream and inspire science to help create a better future for our patients.

Dr. George K.B. Sándor
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Annual General Meeting Highlights

CDA's 2007 Annual General Assembly and Annual General Meeting (AGM) were held April 20 and 21 in Ottawa, chaired by Dr. Ronald Markey of Delta, British Columbia. A great deal of information was discussed this year as a result of the numerous working groups and task forces that were formed in 2006.

Election Results

The General Assembly is responsible for electing CDA's Board of Directors. In this year's elections, Dr. Don Friedlander of Ottawa was elected as CDA vice-president and will become president of CDA in 2009–2010, following the terms of current CDA president Dr. Darryl Smith of Valleyview, Alta., and CDA president-elect Dr. Deborah Stymiest of Fredericton, N.B. Drs. Ronald Smith of Duncan, B.C., and Gary MacDonald from Mount Pearl, N.L., were elected as CDA board members for another term. Three new members will sit on the board in 2007–2008. Drs. Dave Zaparinuk of Victoria, B.C., and Lloyd Skuba of Edmonton, Alta., were elected to open seats, and Dr. Colin Jack of Souris, P.E.I., won his seat by acclamation. Drs. Peter Doig of Dauphin, Man., and Gord W. Johnson of North Battleford, Sask., were acclaimed to serve another term. Rounding out the CDA Board of Directors for 2007–2008 are Drs. Robert MacGregor of Kentville, N.S., Robert Sutherland of Toronto, Ont., and Jack Scott of Edmonton, Alta. Mr. George Weber will remain non-voting director ex officio. ◆

Governance Review

CDA's current governance structure allows for the creation of working groups and task forces to address specific issues or concerns. The Governance Review Working Group was created in 2006 to propose a revised governance structure. Dr. Jack Cottrell, the group's chair, presented the new governance framework for CDA's Board as well as the plan to transition to the new model at the 2008 AGM. Under the new model, known as a 9-4-2 composition, 1 board member would be elected or appointed by each of the 9 corporate members. Four members will be elected to open seats and the president and president-elect will fill the remaining 2 seats.

An interim general assembly will be held each fall and will continue to feature interactive sessions and other knowledge-sharing opportunities. Working groups will be created on an as-needed basis to address emerging issues. The roles and responsibilities of the voting members will remain the same. ◆

ITRANS/e-Business

The AGM discussed the recommendations made in the final report of the ITRANS/e-Business Working Group. Enrolment and transactions doubled in the past year and continue to grow steadily, confirming the need for an Internet-based service for claims transactions. Currently, Continovation Services Inc. is working to make sure that dentists have the infrastructure needed to interact with an Electronic Health Record (EHR). An e-Business/ITRANS Steering Committee will be created to further develop this important program area.

Finally, CDA has been working with the Canada Health Infoway to ensure the business needs of dentists are built into the infrastructure of the EHR. CDA will be organizing a national EHR forum to examine the potential impact of an EHR on dental practice and determine the extent of the profession's future involvement. ◆

Interactive Sessions

Two moderated interactive sessions were held this year. In the first session participants were asked to identify the needs of dentistry, the profession and the general public in the next 2 to 3 years. Participants were then asked to reflect on the successes and accomplishments of organized dentistry in these areas if they were to look back 18 months to 2 years from now. During the second interactive session the discussion focused on how to meet and achieve these needs and goals.

The voting members of the board will hold a November interim meeting that will include an interactive session on roles and responsibilities to carry out these goals. Another interactive session, building on all these sessions and the outcomes of the governance review, will be held in April 2008 to review and modify CDA's Strategic Plan. ◆

The Cochrane Library
Evidence for healthcare decision-making

New CDA Member Service Offers Access to Best Evidence-Based Research

The CDA Resource Centre now offers access to the Cochrane Library, a collection of 7 online databases of high-quality, evidence-based health research conveniently located in a single source. Members can log in to the Cochrane Library through the members' side of CDA's website.

The Cochrane Library contains the latest research on the effectiveness of health care treatments and interventions, current technology assessments, economic evaluations and individual clinical trials. The Library includes the Cochrane Database of Systematic Reviews, the gold standard in evidence-based health care. The Cochrane Oral Health Group produces systematic reviews of evidence-based research on oral health care topics.

For more information on this new member service, visit www.cda-adc.ca/cochrane or contact the CDA Resource Centre.

The Cochrane Library complements the CDA Resource Centre's other electronic services: Lexi-Comp® Online™, CDA Edition at www.cda-adc.ca/lexi and eTable of Contents (eTOC) at www.cda-adc.ca/etoc

U.S. Clinical Trial of Prevora Enrolls First Patient

On April 24, 2007, the Prevention of Adult Caries Study (PACS), a controlled Phase IIIB clinical trial of Prevora, enrolled its first patient. Prevora Antibacterial Tooth Coating, made of 10% w/v chlorhexidine acetate, is designed to prevent adult tooth decay at the gumline. Prevora has been approved for use in Ireland and Canada and was awarded the CDA Seal of Recognition in its Professional Product Recognition program in 2006.

PACS is one of the largest studies ever undertaken to examine prevention of adult tooth decay and will follow 1,000 patients at 4 centres in the United States over a 13-month period. This clinical trial is a step toward Prevora's entrance into the U.S. market.

PACS is sponsored by the National Institute for Dental and Craniofacial Research (NICDR) and CHX Technologies Inc., the producers of Prevora.

Future DAT Registrations Will Be Online Only

Registration for the Dental Aptitude Test (DAT) will be entirely online starting with the November 2007 test. The move away from paper registrations to online only is to streamline and accelerate the registration process. The number of online registrations has been growing steadily each year. In November 2006 and February 2007 more than 2,700 applicants registered for the DAT and 93% of those registrations were online.

Registration deadline for the November 4, 2007 DAT is Saturday, September 15, 2007. The subsequent registration deadline for the February 17, 2008 test date is Tuesday, January 15, 2008. Online registration for both these test dates will open in early July.

To register online or for additional information visit the CDA website at www.cda-adc.ca/dat

Rare HBV Patient-to-Patient Transmission Recorded in the U.S.

A rare case of transmission of the hepatitis B virus (HBV) between 2 patients in a dental office has been reported in the May issue of the *Journal of Infectious Diseases*.[1] This is the only known case of HBV transmission between dental patients documented in the United States.

The report documents the investigation conducted by the Centers for Disease Control and Prevention (CDC) and the New Mexico Department of Health after a 60-year-old woman contracted HBV from routine oral surgery in 2001. The source of transmission was discovered to be a 36-year-old woman with HBV who had also had routine tooth extractions in the same office earlier that day. There was no evidence of infection in any of the office staff.

The exact cause of the transmission was unclear, as monitoring showed the office carried out standard infection control practices. This transmission highlights the importance of strict infection control procedures and routine immunization for health care workers, which in this case reduced the risk of further transmission. There have been no cases of dentist-to-patient HBV transmission reported in the United States since 1987.

Reference

1. Redd JT, Baumbach J, Kohn W, Nainan O, Khristova M, Williams I. Patient-to-patient transmission of hepatitis B virus associated with oral surgery. *J Infect Dis* 2007; 195(9):1311–4. Epub 2007 Mar 21. Available from URL: www.journals.uchicago.edu/JID/journal/issues/v195n9/36695/36695.web.pdf.

Commentary by Dr. George Sándor, *JCDA* Editorial Consultant

The CDC and the New Mexico Department of Health are to be commended for their extremely thorough and detailed analysis of this landmark case. They report this as the first recorded patient-to-patient transmission of HBV in a dental office in the United States, despite no evidence of breakdown in infection control. Likewise, the oral surgery practice must also be commended for their precise documentation and meticulous adherence to routine infection control procedures. This article is highly recommended as significantly important reading material for the entire readership of this journal.

The source patient was a 36-year-old woman with known chronic hepatitis B since 1999 who was treated for 3 extractions. Three patients were treated between the source patient and the index patient who was a 60-year-old woman requiring 7 extractions. The time between the treatments of the 2 patients was less than 3 hours.

These procedures took place in a modern practice with meticulously documented infection control, appropriate use of barrier techniques, a documented strict 1-way flow of needles and carefully documented attention to use of multidose medication vials. Of the 48 other patients treated at that office that week, the Department of Health successfully contacted 27 patients, the majority of whom were tested. In later testing the CDC concluded that the source patient had a high viral load of hepatitis B virus at the time of the oral surgery.

The CDC and the Department of Health concluded that due to the office's layout, strict 1-way flow of needles from the clean area, careful record keeping and lack of observed improper procedures, contamination of multidose medication vials was not a likely mode of transmission.[1] There was also a high rate of hepatitis immunity in the office staff and in the other 27 patients who were treated and tested.

This case illustrates that despite meticulous attention to infection control, transmission of HBV can still occur. The hepatitis B virus is extremely hardy and can survive in dried blood on surfaces for a week or more, or can be infectious on surfaces in the absence of visible blood.[2] Spread by means of surface or clothing contact could not be ruled out in this case.

This case underscores the importance of strict adherence to infection control procedures and the merits of hepatitis B vaccination both for health care workers and the public in general. While such cases are probably exceedingly rare, the day may come when infectious cases may be scheduled at the end of the day's list of operations or restricted to hospital clinics. However, the evidence at the present time does not support such changes in practice patterns. ➧

References

1. Redd JT, Baumbach J, Kohn W, Nainan O, Khristova M, Williams I. Patient-to-patient transmission of hepatitis B virus associated with oral surgery. *J Infect Dis* 2007; 195(9):1311–4. Epub 2007 Mar 21. Available from URL: www.journals.uchicago.edu/JID/journal/issues/v195n9/36695/36695.web.pdf.

2. Bond WW, Favero MS, Petersen NJ, Gravelle CR, Ebert JW, Maynard JE. Survival of hepatitis B virus after drying and storage for one week [letter]. *Lancet* 1981; 1(8219):550–1.

George Sándor, *MD, DDS, PhD, FRCD(C), FRCSC, FACS, is professor and clinical director, graduate program in oral and maxillofacial surgery and anesthesia, University of Toronto and Mount Sinai Hospital; and coordinator of pediatric oral and maxillofacial surgery at the Hospital for Sick Children and Bloorview Kids Rehab.*

AHA Updates Guidelines on Preventing Infective Endocarditis

On April 25, 2007, CDA distributed a *CDAlert* email bulletin about updated guidelines for antibiotic prophylaxis prior to dental procedures to prevent infective endocarditis (IE). The new guidelines were published by the American Heart Association (AHA) in their journal *Circulation*[1] and are available online on the AHA website (www.americanheart.org).

The AHA now recommends that only patients at greatest risk of negative outcomes from infective endocarditis should take short-term preventive antibiotics before routine dental procedures.

According to the AHA, patients who should continue to take preventive antibiotics include those with artificial heart valves, a history of infective endocarditis, certain congenital heart conditions (including a patch to repair the heart defect within the past 6 months), and a cardiac transplant that develops heart valve problems.

As a result of these guideline changes, the Canadian Dental Association's position statement on *Antibiotic Prophylaxis for Dental Patients at Risk* is now under review by the Committee on Clinical and Scientific Affairs.

Reference

1. Wilson W, Taubert KA, Gewitz M, Lockhart PB, Baddour LM, Levison M, and others. Prevention of infective endocarditis. Guidelines from the American Heart Association. A Guideline From the American Heart Association Rheumatic Fever, Endocarditis, and Kawasaki Disease Committee, Council on Cardiovascular Disease in the Young, and the Council on Clinical Cardiology, Council on Cardiovascular Surgery and Anesthesia, and the Quality of Care and Outcomes Research Interdisciplinary Working Group. *Circulation* 2007; Apr 19 [Epub ahead of print].

Commentary by Dr. Joel Epstein, *JCDA* Editorial Consultant

The goal of infective endocarditis (IE) prophylaxis is to target predictable bacteremia due to organisms that can cause endocarditis in patients with increased risk of infection, while employing antibiotic chemotherapy in a responsible manner.[1–4] Although not frequently discussed in the context of IE, the best prevention is to maintain dental health.

The new guidelines will greatly reduce the use of antibiotics for prophylaxis due to evidence that IE is a rare condition and because bacteremia from daily activities is much more likely to cause IE than bacteremia from a dental procedure. Bacteremia associated with daily oral and dental care and chewing is much more frequent than bacteremia associated with dental treatment, which is provided approximately twice yearly on average. Furthermore, even at 100% effectiveness, antibiotic prophylaxis would potentially prevent very few cases of IE following dental treatment.[1–3] The guideline changes are based on a growing body of evidence that the risks of taking preventive antibiotics may outweigh the benefits for many patients. Therefore, only patients at highest risk of IE are recommended for prophylaxis.

Major Changes to the AHA Guidelines

The AHA now recommends antibiotic prophylaxis for patients with prosthetic cardiac valves, previous infective endocarditis, congenital heart disease (CHD) with unrepaired cyanotic CHD, completely repaired congenital heart defects with prosthetic material or device within the first 6 months of the procedure, repaired CHD with residual defects at the site or adjacent to the site of a prosthetic patch or prosthetic device, and cardiac transplant recipients with cardiac valvulopathy.

Prophylaxis is not recommended for patients with heart murmur alone, including those with mitral valve prolapse or with a history of rheumatic fever, which represent the largest number of patients who received prophylaxis following past guidelines.

For those who require antibiotics, no change in the selection of antibiotics has been recommended. Antibiotics are provided in a single dose 30–60 minutes before a dental procedure.

The AHA's recommended changes in IE prophylaxis suggest the need for modifying current health history forms used in dental practice, as questioning patients about heart murmurs and rheumatic fever no longer leads to changes in patient management. Rather, questions should focus on a patient's history of congenital heart disease, prosthetic cardiac valves and prior history of IE.

An earlier study[5] found that dental providers tend to recommend antibiotic guidelines that were in place at the time of graduation from dental school and that medical providers may not be aware of developments in guidelines. The changes in the AHA guidelines will require that the dental and medical community be up to date in following guidelines and educating patients.

It should be anticipated that other guidelines, such as those promulgated by the American Academy of Orthopedic Surgeons for large joint prostheses, will be subject to review. Such recommendations will be subject to more rigorous evidence of the need and effectiveness of antibiotic prophylaxis prior to dental therapy. ◆

References

1. Wilson W, Taubert KA, Gewitz M, Lockhart PB, Baddour LM, Levison M, and others. Prevention of infective endocarditis. Guidelines from the American Heart Association. A Guideline From the American Heart Association Rheumatic Fever, Endocarditis, and Kawasaki Disease Committee, Council on Cardiovascular Disease in the Young, and the Council on Clinical Cardiology, Council on Cardiovascular Surgery and Anesthesia, and the Quality of Care and Outcomes Research Interdisciplinary Working Group. Circulation 2007; Apr 19 [Epub ahead of print].

2. Lockhart PB, Loven B, Brennan MT, Fox PC. The evidence base for the efficacy of antibiotic prophylaxis in dental practice. *JADA* 2007; 138(4):458–74.

3. Epstein JB. Infective endocarditis and dentistry: outcome-based research. *J Can Dent Assoc* 1999; 65(2):95–6.

4. Gould FK, Elliott TSF, Foweraker J, Fulford M, Perry JD, Roberts GJ, and others. Guidelines for the prevention of endocardidits: report of the Working Party of the British Society for Antimcrobial Chemotherapy. *J Antimicrob Chemother* 2006; 57(6):1035–42.

5. Epstein JB, Chong S, Le ND. A survey of antibiotic use in dentistry. *JADA* 2000; 131:1600–9.

Joel Epstein, *DMD, MSD, FRCD(C), is professor and head, department of oral medicine and diagnostic sciences, Chicago Cancer Center, University of Illinois, Chicago, Illinois. Dr. Epstein is the co-author of an article in this edition (p. 401) on which guidelines for antibiotic prophylaxis of infective endocarditis Canadian dentists should follow.*

Dr. Daniel Haas

Canadian Dentist Receives Anesthesia Award

Dr. Daniel Haas has received the Heidbrink Award for 2007, the American Dental Society of Anesthesiology's (ADSA) highest honour.

Dr. Haas, a *JCDA* editorial consultant, is the first Canadian dentist to receive the award. The Heidbrink Award is given each year to an individual who has made outstanding contributions to anesthesia that have benefited dentistry. The award was presented to Dr. Haas at a dinner in his honour April 21 at the ADSA's Annual Meeting, in Monterey, California, where he also delivered the Joseph Osterloh memorial lecture.

Dr. Haas is professor and associate dean in the discipline of anesthesia/department of clinical sciences in the faculty of dentistry at the University of Toronto. He is a member of the *Anesthesia Progress* editorial review board. ◆

AAOMS Position Paper on Bisphosphonate-Related Osteonecrosis of the Jaw

The American Association of Oral and Maxillofacial Surgeons (AAOMS) has released a valuable resource for dentists on bisphosphonate-related osteonecrosis of the jaw (ONJ). In September 2006 the board of trustees of the AAOMS approved the release of its position paper on the topic, which is available from the AAOMS website.[1]

ONJ has been linked to the use of bisphosphonates, which are used to treat cancer-related conditions and osteoporosis. The position paper provides information on the potential risks of developing ONJ, guidance for diagnosing ONJ in patients with a history of treatment with bisphosphonates, and prevention and management of the condition.

Reference

1. American Association of Oral and Maxillofacial Surgeons position paper on bisphosphonate-related osteonecrosis of the jaws. Available from URL: http://www.aaoms.org/docs/position_papers/osteonecrosis.pdf.

Commentary by Dr. Kevin Lung, *JCDA* Editorial Consultant

Bisphosphonates are commonly prescribed to inhibit bone loss in patients with osteoporosis, as well as osteopenia, cancer and Paget's disease of the bone. Bisphosphonates can be administered intravenously or orally, depending on the condition being treated.

Intravenous bisphosphonates are used to reduce bone pain, hypercalcemia of malignancy and skeletal complications in cancer patients. Oral bisphosphonates are commonly used to treat bone loss from osteopenia or osteoporosis. It is important to note that the risks for developing osteonecrosis of the jaw (ONJ) are much higher for cancer patients on intravenous bisphosphonate therapy than for patients on oral bisphosphonates. In fact, 94% of published cases of ONJ are patients with multiple myeloma or metastatic carcinoma to the skeleton who are receiving nitrogen-containing bisphosphonates by IV.[1] This is most likely because bisphosphonates administered intravenously are taken up much more readily by bone than those administered orally.

Current evidence also shows that 60% of osteonecrosis cases occurred after dental surgical procedures such as tooth extraction.[1] For this reason alone, it is vital that all dentists be familiar with the AAOMS position paper and be aware of the potential complications that can occur with patients who receive biphosphonate therapy. ◆

Reference

1. Woo SB, Hellstein JW, Kalmar JR. Systematic review: bisphosphonates and osteonecrosis of the jaws. *Ann Intern Med* 2006; 144(10):753–61.

Related Resource

See Lam DK, Sándor GKB, Holmes HI, Evans AW, Clokie CML. A review of bisphosphonate-associated osteonecrosis of the jaws and its management, on p. 417 of this edition.

Kevin E. Lung, *BSc, DDS, MSc, FRCD(C), is clinical professor in the faculty of medicine and dentistry at the University of Alberta and is also in private practice in oral and maxillofacial surgery at Kingsway Oral Surgery in Edmonton.*

To access the websites mentioned in this section, go to the June 2007 *JCDA* bookmarks at www.cda-adc.ca/jcda/vol-73/issue-5/index.html.

Upcoming Conferences

Conference on Dentist Health and Wellness

"Healthy Dentists, Thriving Practices" is the title of the upcoming Conference on Dentist Health and Wellness hosted by the American Dental Association from August 16–18, 2007, in Chicago, Illinois. The conference will feature 3 concurrent program tracks to address a variety of health and wellness needs for the dental professional: personal growth, professional impairment and, for the first time, ergonomics in dental practice.

For more information about the conference visit http://www.ada.org/prof/events/featured/wellbeing/index.asp ■

Early Childhood Caries Conference

Tooth decay in young children decreased for 40 years, but reached a plateau in the 1990s and is now edging back up. Why do a minority of children get most of the tooth decay? Early childhood caries (ECC) is a preventable, but increasingly prevalent, disease. Depending on its severity, ECC may affect behaviour, diet, permanent tooth formation and overall growth and development. Dental professionals cannot solve this problem on their own because the affected children often do not appear in clinics until the disease is well underway.

To explore the challenges of ECC and the leading edge initiatives to prevent it, the Canadian Academy of Pediatric Dentistry, the Alberta Dental Public Health Association and the Calgary Health Region are presenting *Partnering to reverse the trend*, an ECC conference, from September 28–30, 2007, in Calgary, Alberta. The conference will provide a learning and development opportunity focusing on current ECC science, as well as the family and community context of ECC.

By establishing a dialogue about risk factors, causes, experiences and service barriers, conference delegates will help develop a plan of action to minimize the incidence of ECC in Canada. The key information will be recorded in a summary report for formal documentation.

The ECC conference will present experts from across Canada:

- **Dr. Glenn Berall**, chief of pediatrics at North York General Hospital and staff member at Bloorview Kids Rehab Centre, will discuss the medical perspective of ECC.
- **Dr. Ross Anderson**, head of pediatric dentistry at Dalhousie University and chief of dentistry at the IWK Health Centre in Halifax, will cover the risk factors and transmission of ECC.
- **Dr. Jacques Veronneau**, assistant professor in dentistry at McGill University and specialist in dental public health for the Cree Nation, James Bay, Quebec, will address the scientific research background of ECC — what does and does not work in prevention.
- **Dr. Rosamund Harrison**, professor and chair of pediatric dentistry at the University of British Columbia and winner of the Canadian Dental Association 2004 Oral Health Promotion Award, will talk about ECC's impact on the family and diverse communities, and the challenge of integrating the broader determinants of health (socioeconomic status, culture, access to services) with parenting concerns and family issues.
- **Dr. Peter Cooney**, chief dental officer for Canada, will review the extent of ECC in Canada, the cost of care, access issues and prevention and promotion initiatives for vulnerable groups.

For more information, or to register for the conference (space is limited), visit www.ecc-calgary.ca.

Dr. Luke Shwart
Manager, Community Oral Health Services
Calgary Health Region ■

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5th Annual *CELEBRATING SMILES GALA*
It's All About Giving Back and Creating Legacies!

On April 27, 2007, for the fifth consecutive year, the Dentistry Canada Fund's ***Celebrating Smiles Gala*** vividly demonstrated the generous participation and support of corporate sponsors, the dental profession and numerous other individual supporters. Toronto's stately Royal York Imperial Ballroom resounded with acclaim and approval for the Dentistry Canada Fund's (DCF) Mission to mobilize and allocate resources for the advancement of oral health through education, research and public outreach.

Mr. Brian Douglas, SciCan Ltd.; Dr. David Singer; Mrs. Guylaine McCallum; Dr. Louis Dubé

Of significant note was the full-room audience's increasing enthusiasm and interest for the ***Oral Health-Good For Life™*** Campaign dedicated to raise $10,000,000 over the next five years to establish an endowed fund that includes research addressing the "Silent Epidemic" of oral diseases in seniors and the links between oral health, systemic diseases and their impact on overall general health.

The highlight of each year's ***Celebrating Smiles Gala*** is the presentation of Outstanding Awards to those who not only fully understand the significance of ***It's All About Giving Back and Creating Legacies*** but actually live the truism of Albert Einstein, "***Setting an example is not the main means of influencing others; it is the only means."*** The deserving and honoured recipients for 2007 are:

- **Outstanding Philanthropy Award – Dentistry – Dr. Louis Dubé**
- **Outstanding Philanthropy Award – Industry – SciCan Limited**
- **Outstanding Service Award – Dentistry – Dr. David Singer**
- **Outstanding Service Award – Industry – Mrs. Guylaine McCallum**

For additional information and photos of the 2007 Celebrating Smiles Gala visit www.dcf-fdc.ca

For more details about this transformational campaign, please contact Richard Munro, Campaign Director, toll-free at 1.877.363.0326.

Each year, the Canadian Dental Association (CDA) recognizes individuals for outstanding service to CDA and for their contribution to the dental profession. The Honorary Membership, CDA's highest award, was presented at the President's Installation Dinner. The remaining awards were handed out at the CDA Awards Ceremony and Luncheon. Both events were held on April 20, 2007, in Ottawa, in conjunction with the CDA meeting of the General Assembly.

Honorary Membership Award

This year, the Honorary Membership went to **Dr. Marcia Boyd** of Vancouver, B.C. This award recognizes an outstanding contribution to the art and science of dentistry or to the dental profession over a sustained period of time.

Dr. Marcia Boyd and Dr. Wayne Halstrom, CDA immediate past-president.

Dr. Marcia Boyd has had a distinguished career in academic dentistry and in the development of dental curricula and accreditation. She earned her dental degree from the University of Alberta and an MA in curriculum and evaluation from the University of British Columbia, where she taught in the faculty of dentistry for 29 years, served as acting dean, and is now professor emerita.

Dr. Boyd received honorary membership in the American Dental Association in 2006. She is the immediate past-president of the American College of Dentists (ACD), the second female president and third Canadian to hold this prestigious position in ACD's history.

Distinguished Service Award

CDA's Distinguished Service Award is given in recognition of outstanding service in a given year or over a number of years. Receiving the award in 2007 were **Mr. Kingsley Butler** of Toronto, Ontario, **Mr. Joel Neal** of Ottawa, Ontario, **Dr. Wayne Pulver** of Willowdale, Ontario, and **Dr. Christopher Robinson** of Edmonton, Alberta.

Mr. Kingsley Butler and Dr. Wayne Halstrom.

Mr. Kingsley Butler is the president and chief executive officer at Canadian Dental Service Plans Inc. Mr. Butler guided the company from a staff of 11 to a staff of 58, introducing new products and efficiencies that helped CDSPI flourish as a provider, on behalf of CDA, of insurance and investment programs for Canadian dentists.

In May 2007, Mr. Butler will retire after 26 years at CDSPI. He was a leading force behind many of the products at CDSPI, including the Member's Assistance Program, a confidential councelling and support system for dentists, the CDA malpractice product, and, more recently, a pandemic coverage product that is the only one of its kind in Canada.

Mr. Joel Neal and Dr. Wayne Halstrom.

Mr. Joel Neal is the director of support services at CDA. He has been with CDA since 1986, where he has been instrumental in building and strengthening the Association.

Mr. Neal's vision and creative approach to problem solving has had an impact on CDA in several areas, including human resources, financial reporting, legal, print, production, graphic arts services, facilities and information technology.

Mr. Neal received the CAE Designation from the Canadian Society of Association Executives in 1995. In addition to his stewardship of the Association's largest department, he has worked extensively on corporate membership issues and relations with CDSPI.

Dr. Wayne Pulver and Dr. Wayne Halstrom.

Dr. Wayne Pulver is a long-term member of the Board of Directors of the Ontario Dental Association, and has served as its president. He has also served as governor to CDA. He has been president of the Ontario Society of Endodontists and the North York Dental Society.

Dr. Pulver is a fellow of the Pierre Fauchard Academy, the International College of Dentists, the Academy of Dentistry International and the American College of Dentists. He is responsible for numerous presentations and publications, both locally and internationally, and has been honoured by the University of Toronto faculty of dentistry with the Alumni of Distinction and Dental Students Society awards and the American Association of Endodontists' Endodontic Research Memorial Award.

Dr. Christopher Robinson and Dr. Wayne Halstrom.

Dr. Christopher Robinson's significant achievements in the field of dentistry include a term as president of the Canadian Association of Oral and Maxillofacial Surgeons where he now serves as its executive director. He was founder and first chair of CDA's Committee on Specialist Affairs and has served as president of the Alberta Association of Oral and Maxillofacial Surgeons.

Dr. Robinson was awarded a fellowship in oral and maxillofacial surgery in 1980 by the Royal College of Dentists of Canada. He has been a professor in the field for over 25 years at the University of Alberta faculty of medicine and dentistry. There, he co-developed the original third- and fourth-year curriculum on dental implants. He is a founder and clinical fellow at the Craniofacial Osseointegration and Maxillofacial Prosthetic Rehabilitation Unit at Misericordia Community Hospital in Edmonton..

Award of Merit

The Award of Merit is given in recognition of outstanding service in the governing of CDA or a similar outstanding contribution to Canadian dentistry. Receiving the award this year were **Dr. Gary Butler** of St. John's, Newfoundland, and **Dr. Elizabeth MacSween** of Orleans, Ontario.

Dr. Gary Bulter and Dr. Darryl Smith, CDA president.

Dr. Gary Butler has provided the field of Canadian dentistry with outstanding leadership through his terms as president of the Newfoundland & Labrador Dental Association (NLDA) and as governor to CDA. He has served on 15 different committees for CDA and NLDA, where he is currently treasurer.

Dr. Butler has led many organizational and dental teams, acting as chair of the CDA Task Force on Denturism, chief of dentistry at the Janeway Child Health Care Centre in St. John's, two-time chair of the NLDA Convention and as a member of the board of directors of the St. John's Children's Rehabilitation Centre.

Dr. Butler is a recipient of the NLDA Award of Merit and a fellow of the Pierre Fauchard Academy.

Dr. Elizabeth MacSween and Dr. Darryl Smith.

Dr. Elizabeth MacSween is a former president of the Ontario Dental Association (ODA) and a past recipient of CDA's Certificate of Merit for her work on the Government Relations Steering Committee. She has served in various capacities with ODA, CDA and as president of the University of Toronto Alumni Association.

Dr. MacSween has practised dentistry for over 27 years. Her many career highlights include a stint on the Dental Program Advisory Council at Algonquin College in Ottawa, where she acted as a clinical instructor. She has held terms as treasurer, secretary, vice-president, and finally, president, of the Ottawa Dental Society.

Dr. MacSween is vice-president of the Royal College of Dental Surgeons of Ontario and currently maintains a private practice in Orleans, Ontario.

Oral Health Promotion Award

The Oral Health Promotion Award recognizes individuals or organizations that have improved the oral health of Canadians through oral health promotion. There were 2 recipients this year: **Community Dental Day** of the British Columbia Dental Association, and **Dr. Douglas Elroy Phillips**, of Nipawin, Saskatchewan.

Taking place as part of National Oral Health Month, **Community Dental Day** sees British Columbia dentists treating low-income adults across the province free of charge. Many dental staff volunteer their services as well.

Dr. Deborah Stymiest, CDA vice-president, and Dr. Tony Gill, president of the British Columbia Dental Association.

A continuing initiative since 2003, **Community Dental Day** was started by the Association of Dental Surgeons of British Columbia not only as a great way for dentists to give back to the community, but also to raise oral health awareness and enhance the profile of dentistry in general.

Community Dental Day was initially conceived by Dr. John W. Hutchinson, a Richmond, B.C., dentist who spends much of his year practising in third-world countries. Since the inception of this annual event, more than 4,200 low-income working adults, seniors and single parents province-wide have received over $1.4 million worth of free dental treatment.

Dr. Deborah Stymiest and Dr. Douglas Elroy Phillips.

Dr. Douglas Elroy Phillips has dedicated much of his career to providing dental services to the homebound and those in remote or isolated communities who might otherwise have difficulty receiving care. This approach to dentistry has seen him practise in locales as varied as rural Saskatchewan and Malawi, Africa.

Dr. Phillips pioneered the "Dental Care for the Homebound" program. He is currently developing a best practices model and promoting increased access to care for marginalized groups. He has provided extensive care to remote First Nations communities, and instituted training initiatives for First Nations dental aides. He is an instructor, supervisor and curriculum developer at the National School of Dental Therapy.

Dr. Phillips has spent most of his 48-year career practising in Saskatchewan.

Special Friend of Canadian Dentistry Award

Mr. George Rhodes

The Special Friend of Canadian Dentistry Award is given in appreciation for assistance to CDA. This year, the award was presented to **Mr. George Rhodes**, the former vice-president of professional relations and corporate communications at Dentsply International in York, Pennsylvania.

Dentsply's generous sponsorship through the Canadian Dentistry Fund has fostered the CDA/Dentsply Student Clinician Program. The program, now in its 36th year, allows student representatives from each of Canada's 10 dental faculties to attend CDA's annual meeting to compete and participate in the scientific program.

Since joining Dentsply in 1973, Mr. Rhodes has been instrumental in the program's success and has helped expand it into 35 countries on 6 continents.

Certificate of Merit

This award recognizes any special service at any level of dentistry within the country, specifically those who have served in some capacity on a CDA committee, council, commission, task force or long-standing service at the corporate or specialty section level. The following individuals were recognized in 2007:

Committee on Dental Academia
Dr. Johann De Vries
Dr. Anjali Seth

Council on Education
Dr. Johann De Vries
Dr. James L. Leake
Ms. Barbara Peterson
Dr. Robert Salois
Dr. Gordon W. Thompson

Committee on Specialist Affairs
Dr. Ross D. Anderson
Dr. Robert I. Hatheway
Dr. Michael J. Pharoah
Dr. Wayne H. Pulver

Committee on Clinical and Scientific Affairs
Dr. Thomas C. Petersen

Committee on Student Affairs
Dr. Alexis Desrosiers
Dr. Katherine Marie Kousaie
Dr. Arun Misra
Dr. Mark Nicolucci
Dr. Razvan Pitic
Dr. Marie-Laure Prins
Dr. Ante Semren
Dr. Andrew Peter Smyth
Dr. Mark Venditti

Dental Admissions Working Group
Dr. Edward Shields

Dr. Bernard Dolansky and Dr. Jean-Philippe Fréchette.

2007 Biennial Research Award

This Dentistry Canada Fund (DCF) award recognizes research related to dentistry conducted by graduate or post-graduate students in Canada. This year's award went to **Dr. Jean-Philippe Fréchette** of Montreal, Quebec. The award was presented by Dr. Bernard Dolansky, president and chairman of DCF.

Dr. Wayne Halstrom and Colonel Scott A. Becker.

Health Services Civilian–Military Cooperation Award

CDA was the recipient of this award recognizing excellence and dedicated commitment to the partnership with the Canadian Forces Health Services Group. The award, presented by Colonel Scott A. Becker, director dental services, Canadian Forces Dental Services, was accepted by Dr. Wayne Halstrom.

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The Latest on Dental Consultations in Canada

Every 2 years, Statistics Canada collects population information on health determinants, health status and health system utilization for the Canadian population through the Canadian Community Health Survey (CCHS). In a previous column,[1] I reported on dental consultation results from the 2003 CCHS. This time I am reporting on the results from the latest release of the survey, conducted between January and December 2005.

Contact Rates with Dental Professionals

The contact rate with dental professionals (i.e., at least once in a 12-month period) for all Canadians aged 12 and over was 63.7% in 2005. This number has remained constant since 2003. In 2005, the 12- to 19-year age group had the greatest dental consultation rate at 78.6%, while the 75 years and older group had the lowest at 40.8%.

Approximately 4 out of 5 adolescents in the 12- to 19-year age group consulted a dentist in 2005. Proportionately, almost twice as many people in this age group consulted a dentist than in the 75 years and older age group. Less than half of people 65 years and older consulted with dental professionals in 2005. The province/territory with the greatest dental consultation rate was Ontario at 69.7%, while the lowest rate was in Newfoundland/Labrador at 48.3%.

This most recent CCHS cycle included a supplemental module on dental visits asking additional questions on dental consultations that were not part of the 2003 survey. Only Newfoundland, Ontario, Saskatchewan, Nunavut and Yukon participated in this module; therefore, only these 5 provinces and territories are represented in the results. The following national observations can be inferred based on their responses.

Approximately two-thirds (66.5%) of respondents last visited a dentist less than a year ago, one-tenth (10%) last visited a dentist 1 to 2 years ago and approximately one-tenth (9.5%) last visited their dentist between 2 and 5 years ago. Approximately 1 in a 100 (1.1%) respondents had been to a dentist over 5 years ago, and nearly one-tenth (8.3%) of respondents had never been to a dentist.

The provincial/territorial results show that out of these provinces/territories, Ontarians see their dentists most frequently, with approximately 85% having consulted a dentist within the last 2 years. One-fifth (19.9%) of Newfoundlanders have not seen a dentist in over 5 years.

Reasons for Not Consulting a Dentist

Respondents who indicated they had not consulted a dentist for 3 years or more were asked to specify why not. Although more than one response was acceptable, most people gave only one answer. The most common reason cited for not going to the dentist (**Fig. 1**) was that respondents did not think it was necessary (35%). Only 7.4% of respondents indicated fear as a reason for not going to the dentist.

The other significant reason given by respondents for not going to the dentist was because they wore dentures (30.4%). Cost was cited by 18.4% of respondents and less than 5% indicated their reason for not visiting a dentist was lack of availability of dental offices.

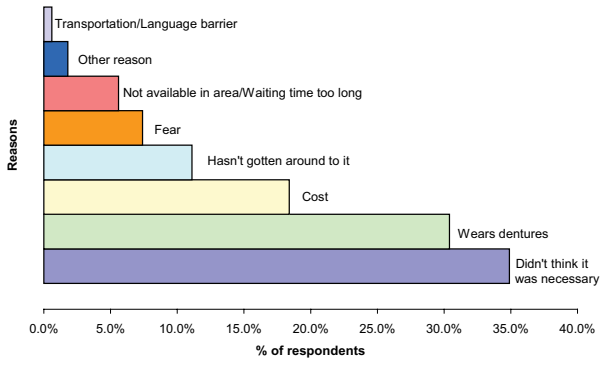

Figure 1: Reasons for not going to the dentist (for 3 years or more)

Source: Canadian Community Health Survey Cycle 3.1 Master File, 2005
Note: As the dental visits module was part of the optional selection in CCHS 3.1, provincial uptake varied. Ontario respondents represent 89% of responses within the data presented.

THE AUTHOR

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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. Readers are encouraged to do more reading on the topics covered. This month's questions were answered by members of the Canadian Academy of Dental Anaesthesia.

QUESTION 1

What factors should I keep in mind in performing dental anesthesia?

Background

The regular use of regional anesthesia is one of the aspects of dental practice that sets dentists apart from most other health care practitioners. The ability to anesthetize the dental tissues has been one of the most important advances in dentistry. Many, if not most, of the dental procedures performed today could not be done on conscious patients without local anesthesia. Anesthetics are probably the most common type of drug used in dentistry; a 1995 report estimated that 11 million cartridges were used annually in Ontario alone.[1] For the most part, dental anesthetics are used well; however, a number of commonly accepted but incorrect beliefs may prevent dentists from providing the best possible service to patients.

Maximum Amount of Local Anesthetic for Adults

Five local anesthetic agents are commonly used in North America: lidocaine, articaine, prilocaine, mepivacaine and bupivacaine. These agents differ in terms of their properties and preparations, but their safety guidelines are similar. The maximum dose of local anesthetic is generally calculated in terms of milligrams per kilogram (mg/kg) body weight. For lidocaine, articaine, prilocaine and mepivacaine, the approximate maximum is 7 mg/kg if the preparation contains a vasoconstrictor. This guideline applies to a "typical" healthy young adult with a body weight of 70 kg, for whom the total dose would be about 500 mg (or almost fourteen 1.8-mL cartridges of lidocaine). The notable exception to this guideline is bupivacaine, which has a dosage limit of 2 mg/kg (i.e., 150 mg for the typical adult). Interestingly, these recommendations from the drug manufacturers can differ from other published recommendations.[2] Nonetheless, these guidelines have worked well in both dentistry and medicine.

The other component of regional anesthetics that is of concern for toxic or unwanted effects is the vasoconstrictor, usually epinephrine. Other vasoconstrictors include levonordefrin and felypressin. The purpose of the vasoconstrictor is to decrease circulation in the area of administration, which in turn allows more molecules of the local anesthetic to penetrate the nerve sheath and exert sensory blockade. The intraneural area is not highly vascular, so the presence of a vasoconstrictor can affect the depth and duration of anesthesia. Of course, vasoconstrictors also have systemic effects. Of particular concern are the cardiovascular effects (e.g., increased cardiac workload and increased peripheral vasoconstriction). The accepted maximum dose of epinephrine for young, healthy adults is 0.2 mg (200 μg), which represents about eleven 1.8-mL cartridges of local anesthetic containing epinephrine at 1:100 000. Again, this guideline was not reached empirically, but has worked well.

In terms of safety considerations, each patient's age and medical status must be considered. Issues related to either or both of these factors will reduce the allowable total of local anesthetic.

Appropriate Size of Needle for Administering Local Anesthetic

Although patient comfort is of paramount importance, thin dental needles offer few advantages and present some significant disadvantages. First, research has suggested that there are no significant differences in terms of pain perception with needles of different gauges.[3,4] Second, reliable aspiration results are less likely with thinner needles, which could lead to systemic adverse effects as well as failure of anesthesia due to intravascular injection. Third, thinner needles will deflect more in tissue than larger-gauge needles,[5,6] which could introduce inaccuracies that might result in failure of anesthesia.

As a general rule, for safety, comfort and effectiveness, it is advisable to use 25-gauge needles (either long or short), as well as topical anesthesia, when administering local anesthesia.

THE AUTHOR

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QUESTION 2

What oral sedatives can I use for my adult patients?

Background

For adult patients, the most common use of oral sedation is to reduce anxiety before and during dental appointments. Occasionally, oral sedation is used the night before the appointment to ensure a more restful sleep, so that the patient can be more relaxed during the dental appointment.[1]

If an oral sedative has been used, the patient should be advised not to drive or consume alcohol for a period of approximately 24 hours after the appointment. When leaving the dental office after the appointment, a patient who has been sedated must be escorted by a responsible adult. It is recommended that any oral sedative be administered in the controlled and monitored environment of the dental office. This allows the presence of an escort to be confirmed; in addition, the treatment can be confirmed and informed consent obtained before the patient takes the sedative medication. If the sedative is given the night before, the same precautions are needed: the patient's safe travel to and from the dental office must be ensured and dental treatment confirmed before sedation is administered.

Choosing and Administering an Oral Sedative

The sedative drug should be selected on the basis of the patient's age, weight and medical history, rather than the length of time required for the dental treatment. The choice of medication also depends on the clinician's experience with and knowledge of the pharmacology of the particular drug. For example, sensitivity to benzodiazepines increases with age and in the presence of liver disease and decreases with smoking, recent use of alcohol and in the presence of other benzodiazepines.[2]

Ideally, the selected sedative should be administered in a shorter trial appointment, to determine its effectiveness for the particular patient. The amount administered should always be the lowest effective dose. Following the initial appointment, discussions with the patient will determine the drug type and dose to be used during subsequent appointments.

In dentistry, benzodiazepines are commonly used as oral sedative agents (**Table 1**). For dental procedures of short to moderate duration (up to 2 hours) in adults, triazolam, a short-acting benzodiazepine can be given. Higher doses (0.375 to 0.5 mg) have been used for some patients, but caution is required for these higher doses. Triazolam is a popular choice among clinicians because of its predictable anxiolytic, hypnotic and amnestic effects, which are desirable for dental patients. This drug has a relatively short half-life, with little residual hangover effect the next day. For longer appointments (2 to 4 hours), a longer-acting benzodiazepine such as lorazepam may be prescribed.

Antihistamines such as diphenhydramine and hydroxyzine have also been used as sedatives for

Table 1 Recommended doses of oral sedatives

Oral sedative	Brand name	Dose	Timing of dose before the procedure	Half-life
Benzodiazepines				
Triazolam	Halcion (Pfizer)	0.125 to 0.25 mg	1 hour	1.5 to 5 hours
Lorazepam	Ativan (Biovail Pharmaceuticals)	1 to 4 mg	Oral preparation: 1 to 2 hours Sublingual preparation: 30 to 60 minutes	10 to 20 hours
Antihistamines				
Diphenhydramine	Benadryl (Pfizer)	50 mg	1 hour	4 to 8 hours
Hydroxyzine	Atarax (Pfizer)	50 to 100 mg	1 hour	3 to 20 hours
Promethazine	Phenergan (Novartis)	25 to 50 mg	1 hour	7 to 15 hours

short to long procedures (**Table 1**). Yet another antihistamine with a half-life similar to that of hydroxyzine is promethazine. Patients taking this drug may experience anticholinergic side effects such as dry mouth. For patients with angle-closure glaucoma, these antihistamines should be avoided.

Use of Oral Sedatives in Elderly Patients

Many physiological and psychological changes take place with age, such as decreases in cerebral blood flow, cardiac output, renal and hepatic blood flow, and pulmonary function. Furthermore, older individuals tend to have at least 1 chronic condition, such as heart disease, hypertension, arthritis, osteoporosis or diabetes mellitus, all of which necessitate long-term control with drug therapy and occasionally surgery. In addition, there are pharmacodynamic and pharmacokinetic differences between younger and older patients.[3]

Pharmacokinetically, oral absorption, hepatic metabolism and renal clearance all decrease with age. Pharmacodynamically, oral sedatives and other depressants of the central nervous system tend to have a greater effect in elderly people. These differences, together with the occurrence of polypharmacy in this patient population, have led to the use of lower dosages and shorter-acting medications to avoid oversedation.[3]

In older patients, a short-acting benzodiazepine such as triazolam at a starting dose of 0.125 to 0.25 mg, given 1 hour before the dental appointment, may be effective. For longer appointments, lorazepam 0.5 to 1 mg may be given orally 1 to 2 hours before the procedure (30 to 60 minutes before for the sublingual preparation). The long half-life of diazepam is further extended in elderly patients; thus, the use of this drug is not recommended for this patient population.

THE AUTHOR

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QUESTION 3

How does nitroglycerin work, and when should I use it?

Background

For dental office emergencies, nitroglycerin is supplied as either a sublingual metered-dose (0.4-mg) spray or a rapidly dissolving sublingual tablet (0.3 to 0.6 mg). This drug can also be obtained as an intravenous solution, a paste, a transdermal patch or oral extended-release tablet, but these forms should not be kept in the emergency kit in a dental office.

There is some evidence that the effect from the sublingual spray is more rapid than that of the sublingual tablet, possibly because of occasional failure of the tablet to dissociate under the tongue. Also, once the bottle of sublingual tablets is opened and there is exposure to light or air, the tablets have a short shelf-life of about 3 months.

Mechanism of Action

A common misconception is that nitroglycerin works primarily by dilating the coronary arteries, thereby increasing myocardial oxygen flow. Although this effect does occur to some degree and will aid in the relief of angina pectoris caused by vasospasm, the function of nitroglycerin as a peripheral venodilator is its primary mechanism of action. Because nitroglycerin allows blood to pool in the peripheries, less blood is available to return to the heart. As a result, the heart pumps less blood against less resistance, so there is a lesser myocardial demand for oxygen.

Management of Angina Pectoris

The symptoms of angina pectoris include a burning or squeezing sensation in the chest or substernal area, often accompanied by shortness of breath, dizziness, diaphoresis and nausea or vomiting. Its cause is simple: the myocardial demand for oxygen exceeds supply, which leads to areas of ischemia within the heart and consequent pain.

If you believe that a patient is experiencing angina, immediately stop the procedure. Do your best to help the patient to relax, to minimize endogenous production of catecholamine, which will increase myocardial oxygen demand. Place the patient in the Fowler position (upright or semi-upright), and give oxygen by mask. Take a blood pressure reading; if the systolic pressure is above 90 mm Hg, administer nitroglycerin sublingually every 5 minutes until the symptoms pass. Remember to retake the patient's blood pressure after every dose.

If the pain persists after 3 doses, nitroglycerin is unlikely to be effective. In this situation, contact emergency medical services. Assume that the patient is experiencing myocardial infarction, and administer acetylsalicylic acid (160 or 325 mg), provided the patient has no contraindications to this drug. To help control pain at this point, consider adding morphine or nitrous oxide, if available (this gas significantly reduces the pain of myocardial ischemia).

Nitroglycerin must not be administered within 24 hours after a patient takes sildenafil (Viagra) or vardenafil (Levitra) or within 48 hours after tadalafil (Cialis), as significant and irreversible hypotension may result from these combinations.

THE AUTHOR

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QUESTION 4

What do I need to know about the use of oxygen in the dental office?

Background

Oxygen, an element that is essential for life, is naturally present in atmospheric air at a concentration of 21%. Although contained in the air we breathe, oxygen is considered a drug and is in fact the most important emergency drug available. It is indicated in all medical emergencies except hyperventilation and is routinely given during inhalational, oral and parenteral sedation. A portable source of oxygen should be present in every dental office, and dentists should be confident about its safe and proper use. The location of the oxygen source should be known to all staff members, and the equipment should be checked regularly and serviced to ensure optimum performance.

How Is Oxygen Stored?

Oxygen is stored under pressure (as a compressed gas) at room temperature in cylinders of various sizes, each designated by a letter. The E cylinder is the size recommended for emergency use in dental offices because of its portability and the amount of oxygen available. Gas cylinders are colour coded for ease of identification. In Canada, the cylinders are white, which is the international coding for oxygen. In the United States, the cylinders are green.

How Much Oxygen Is Contained in an E Cylinder?

A full E cylinder contains about 660 L of oxygen at a pressure of 2000 to 2200 psi (**Fig. 1**). Since oxygen remains a gas under pressure (above its critical temperature of –119°C), the pressure of the cylinder can be used to determine its volume. For example, if the pressure gauge reads 1000 psi, the cylinder is half full and therefore contains about 330 L of oxygen.

How Does the Oxygen Get from the Cylinder to the Nozzle?

For the delivery of oxygen to the patient, a regulator (**Fig. 2**) is attached to the oxygen tank, which reduces the pressure from high (2000 psi for a full cylinder) to low (approximately 50 psi). The regulator contains a pressure gauge as well as a flowmeter, which is calibrated to deliver oxygen in litres per minute. The flowmeter valve can be adjusted to deliver oxygen from 0.5 or 1 L/min to 15 L/min.

How Do I Operate the Flowmeter and Cylinder Valve?

A wrench is used to open and close the cylinder valve; this wrench should be chained to the regulator to prevent misplacement. The cylinder valve should be opened during use and closed during storage and when attaching and removing the regulator, to prevent leakage. When changing cylinders it is important to note the presence of the washer (**Fig. 2**), which can be easily lost, resulting in a leak. Spare washers should be readily available (preferably placed in a bag attached to the regulator).

The flowmeter valve is turned to the desired flow rate, which depends on the delivery system and the patient's oxygen demand.

Figure 1: Pressure gauge for an oxygen tank showing 2000 psi.

Figure 2: Regulator for an oxygen tank; note the presence of the washer.

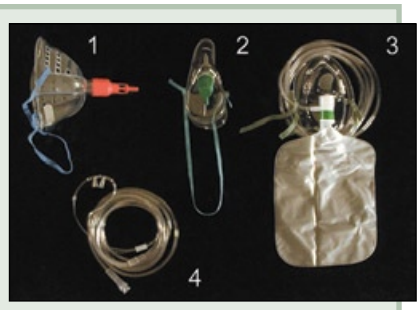

Figure 3: Oxygen delivery devices: Venturi mask (1), simple mask (Hudson) (2), partial rebreather mask (3), and nasal cannula (4).

Table 1 Methods of oxygen delivery

Delivery system	Flow (L/min)	Oxygen delivered (%)
Nasal cannula	1 to 6	24 to 44
Simple mask	5 to 10	35 to 50
Partial rebreather mask	6 to 10	40 to 70
Nonrebreather mask	10 (minimum)	60 to 80
Venturi mask	4 to 10	24 to 55

How Is the Oxygen Delivered to the Patient?

If the patient is breathing spontaneously, oxygen can be delivered by nasal cannula (nasal prongs), simple face mask (Hudson RCI, Teleflex Medical, Research Triangle Park, N.C.), Venturi mask (Ventimask, Flexicare, Wales, U.K.), or a partial rebreathing or non-rebreathing mask (**Fig. 3; Table 1**).

The nasal cannula is the least intrusive method of oxygen delivery. It works by filling the oropharynx and nasopharynx with oxygen. Because this volume is relatively small, room air is entrained during inspiration, which dilutes the concentration of oxygen. As a rule of thumb, each litre per minute of oxygen delivered increases the inspired concentration of oxygen (FiO_2) by approximately 4%. Beyond 6 L/min, the oropharynx and nasopharynx are completely filled with oxygen and no additional increase in concentration is achieved with greater oxygen flow rates. These high flow rates will cause drying and irritation of the nasal mucosa and are not recommended. The approximate maximum concentration of inspired oxygen is 20% + (6 L/min × 4%) = 44%.

Simple face masks can deliver higher concentrations (35% to 50%) than nasal cannulae, depending on the flow rate and minute ventilation. The inspired concentration is limited by the entrainment of room air and rebreathing of expired gases. Partial rebreathing masks (delivery of 40% to 70% oxygen) have a reservoir bag to decrease rebreathing and entrainment of room air, whereas non-rebreathing masks (delivery of 60% to 80% oxygen) have both a reservoir and valves. The valves prevent expired gases from entering the reservoir bag and also prevent entrainment of room air during inspiration. These masks should be used with a flow rate of at least 6 L/min.

Colour-coded Venturi masks deliver a fixed oxygen concentration. The oxygen is delivered at high velocity through a narrow tube which entrains room air to deliver a specific oxygen concentration at a specific flow rate.

For a non-breathing patient, a bag-valve-mask is used for resuscitation. As its name suggests, this device consists of a bag, which is squeezed to deliver positive pressure ventilation; a valve, which prevents rebreathing and entrainment of room air; and a full face mask. A reservoir bag allows delivery of 100% oxygen when the flow rate is equal to the minute ventilation. Use of this device is limited to people with adequate training because of the difficulty of maintaining a patent airway, mask seal and minute ventilation.

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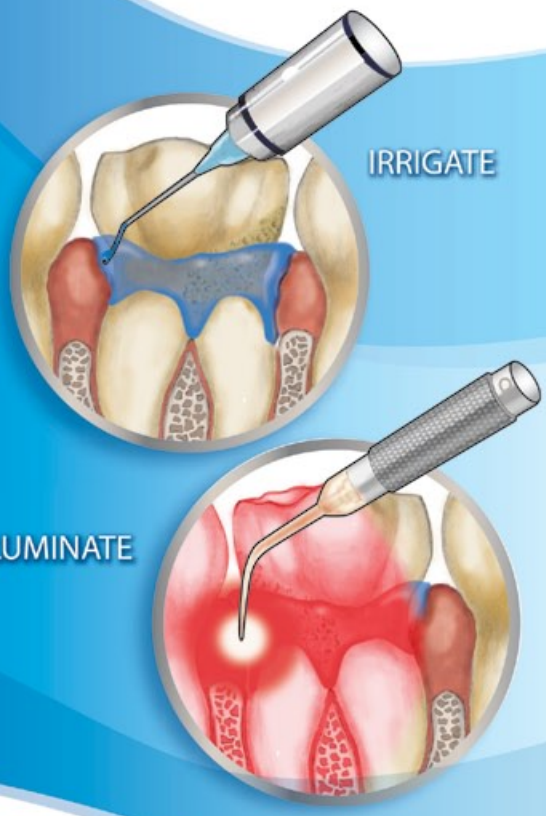

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Which Antibiotic Prophylaxis Guidelines for Infective Endocarditis Should Canadian Dentists Follow?

Herve Y. Sroussi, *DMD, PhD;* ***Ashwin R. Prabhu,*** *BDS;*
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Dental providers must keep up to date with antibiotic prophylaxis guidelines for infectious endocarditis (IE) as these guidelines represent standards of care and determine medicolegal standards. A survey of Canadian dentists revealed that practitioners tend to employ antibiotic prophylaxis according to the guidelines in place at the time of their graduation from dental school — guidelines that often do not meet the current standards,[1] as both the American Heart Association (AHA)[2] and the British Society for Antimicrobial Chemotherapy (BSAC)[3] have currently updated their recommendations.

Host factors that increase the risk of IE include specific cardiac abnormalities, a previous episode of IE and the extent of the dental procedure to be undertaken (**Table 1**). In the 2007 revision of its recommendations, the AHA limited the conditions for which endocarditis prophylaxis is recommended before dental treatment to those associated with the highest risk (**Table 2**). It is important to note that valvular disease independent of regurgitation is not a condition for which the AHA recommends prophylaxis.[2] This will result in considerable reduction in the use of IE antibacterial prophylaxis.

It is believed that invasive dental procedures associated with bleeding increase the risk of oral bacteria entering the blood circulation. Although there is evidence that the risk of infection due to treatment-related bacteremia may occur during a short window of less than 2 weeks following a procedure, dental procedures conducted even months earlier may be questioned as causative of IE.[4] Furthermore, periodontal and dental disease increase the risk of bacteremia with activities of daily living and may more commonly cause bacteremia; therefore, good oral care is of paramount importance in patients with conditions that place them at risk for IE.

To reduce the risk of IE following dental procedures, prophylactic measures have been developed by experts in the fields of microbiology, epidemiology, cardiology and dentistry. The principle preventive measure recommended is the use of prophylactic antibiotics before certain dental procedures in patients identified as at risk.

The first AHA-recommended prophylaxis regimen was issued in 1955; the most current recommendations were issued in 2007.[2] The British Cardiac Society[5] and the BSAC[3] have also recently updated their recommendations for IE prophylaxis (in 2004 and 2006, respectively). This article provides a summary of those guidelines and notes the differences among them.

The continuing evolution of IE prophylaxis guidelines has recognized the natural history of the condition, risk factors, animal research, epidemiology and review of antibiotic prophylaxis failures. The guidelines also reflect an increasing need to guard against overuse of antibiotics. In Canada, using either the current British or American guidelines may

Table 1 Guidelines for the identification of patients who may require prophylaxis for infective endocarditis before dental procedures

American Heart Association[2]	British Society for Antimicrobial Chemotherapy[3]	British Cardiac Society[5]
High risk • Prosthetic cardiac valve • Previous infective endocarditis • Congenital heart disease (CHD) if 1 of the 3 conditions listed below: 1. Unrepaired cyanotic CHD, including palliative shunts and conduits 2. Completely repaired congenital heart defect with prosthetic material or device, whether placed by surgery or by catheter intervention, during the first 6 months after the procedure 3. Repaired CHD with residual defects at the site or adjacent to the site of a prosthetic patch or prosthetic device (which inhibit endothelialization) • Cardiac transplantation recipients who develop cardiac valvulopathy	**High risk** • Previous infective endocarditis • Cardiac valve replacement surgery, i.e., mechanical or biologic prosthetic valves • Surgically constructed systemic or pulmonary shunt or conduit	**High risk** • Prosthetic heart valves • Previous infective endocarditis • Complex cyanotic congenital heart disease • Transposition of great arteries • Fallot's tetralogy • Gerbode's effect • Surgically constructed systemic pulmonary shunts or conduits • Mitral valve prolapse with clinically significant mitral regurgitation or thickened valve leaflets **Moderate risk** • Acquired valvular heart disease, e.g., rheumatic heart disease • Aortic stenosis • Aortic regurgitation • Mitral regurgitation • Other structural cardiac defects, e.g., ventricular septal defect • Bicuspid aortic valve • Primum atrial septal defect • Patent ductus arteriosus • Aortic root replacement • Coarctation of aorta • Atrial septal aneurysm/patent foramen ovale

provide justifiable patient care and, therefore, may manage the medicolegal necessities of practice (**Tables 3** to **5**).

Providers must choose the most recent guidelines from recognized authorities. In the United States, this is limited to AHA guidelines, but in Canada, either the AHA or one of the British societies could be chosen as the authoritative body. Whichever guidelines are employed, it is imperative that they be followed as promoted and that the most recent version be used.

Before considering antibacterial prophylaxis, both the patient and the procedure should be defined as at risk (i.e., bleeding risk, bacteremia risk and subject at risk).

When a dental provider consults with a physician, it is important for the dentist to provide detailed information on the current guidelines to be used, as the dental community may be more aware of these, the patient's dental condition and the risk of bleeding or bacteremia anticipated with the procedure.

Table 2 Dental procedures for which antibiotic prophylaxis is recommended

American Heart Association[2]	British Society for Antimicrobial Chemotherapy[3]	British Cardiac Society[5]
Manipulation of gingival, periodontal and periapical tissues; incision of mucosa including: • surgery • periodontal procedures • endodontic instrumentation beyond the apex or apical surgery • subgingival placement of antibiotic fibres or strips • initial placement of orthodontic bands but not brackets • intraligamentary local anesthetic injections • prophylactic cleaning of teeth or implants where bleeding is anticipated Excluding: local anesthetic placement (unless through site of infection)	Dental procedures involving dento-gingival manipulation and endodontics. A risk assessment, which involves the patient, is important and factors like the oral hygiene status of the patient are important considerations for deciding on prophylaxis.	**Examination procedures** • periodontal probing **Investigation procedures** • sialography **Anesthetic procedures** • intraligamental local anesthesia **All surgical procedures** **Restorative procedures**[a] • rubber dam placement • matrix band and wedge placement • gingival retraction cord placement **Periodontal procedures** **Professional cleaning procedures** • polishing teeth with a rubber cup • oral irrigation with water jet • scaling, root planing • antibiotic fibres or strips placed subgingivally[b] **Endodontic procedures** • root canal instrumentation beyond the root apex **Avulsed tooth reimplantation**[c] **Orthodontic procedures** • tooth separation • exposure or exposure and bonding of tooth or teeth

[a]*For multiple dental visits, alternating antibiotics are recommended, e.g., amoxicillin–clindamycin–amoxicillin. For young children the sequence would be amoxicillin–azithromycin–amoxicillin. If penicillin or penicillin-like antibiotics are used, at least 1 month must be allowed between visits. Dentists should provide as much treatment as is feasible each visit.*
[b]*No data, but procedure is similar to gingival retraction cord placement.*
[c]*The avulsed tooth can be quickly washed and reimplanted immediately by a parent or other responsible person and the antibiotic prophylaxis administered afterward, provided this is within 2 hours of the reimplantation. Antibiotic prophylaxis may be successful if administered shortly after the bacteremic episode.*

Table 3 American Heart Association regimens for infective endocarditis prophylaxis[2]

Patient group	Antibiotic	Route	Dose		Timing before procedure
			Adults	Children	
Standard general prophylaxis for patients at risk	Amoxicillin	PO	2 g	50 mg/kg	1 hour
Unable to take oral medication	Ampicillin	IV or IM	2 g	50 mg/kg	Within 30 minutes
Allergic to penicillin/ amoxicillin/ampicillin	Clindamycin	PO	600 mg	20 mg/kg	1 hour
	Cephalexin or cephadroxil[a]	PO	2 g	50 mg/kg	1 hour
	Azithromycin or clarithromycin	PO	500 mg	15 mg/kg	1 hour
Allergic to penicillin/ amoxicillin/ampicillin and unable to take oral medications	Clindamycin	IV	600 mg	20 mg/kg	Within 30 minutes
	Cefazolin	IV	1 g	25 mg/kg	Within 30 minutes

Note: IV = intravenous; PO = oral.
[a]*Cephalosporins should not be used with penicillin or ampicillin in those with a history of anaphylaxis, angioedema or urticaria.*

Table 4 Recommendations for infective endocarditis prophylaxis regimen by the British Society for Antimicrobial Chemotherapy[3]

Patient group	Antibiotic	Route	Dose according to age of patient; years			Timing of dose before procedure
			> 10	5–10	< 5	
General	Amoxicillin	PO	3 g	1.5 g	750 mg	1 hour
Allergic to penicillin	Clindamycin	PO	600 mg	300 mg	150 mg	1 hour
Allergic to penicillin and unable to swallow capsules	Azithromycin	PO	500 mg	300 mg	200 mg	1 hour
IV regimen expedient	Amoxicillin	IV	1 g	500 mg	250 mg	Just before the procedure or at induction of anesthesia
IV regimen expedient and allergic to penicillin	Clindamycin	IV	300 mg[a]	150 mg[a]	75 mg[a]	Just before the procedure or at induction of anesthesia

Note: IV = intravenous; PO = oral.
[a]Given over at least 10 minutes before the dental procedure.
Preoperative mouth rinse may be used: chlorhexidine gluconate 0.2% (10 mL for 1 minute).

Table 5 British Society for Antimicrobial Chemotherapy recommendations for infective endocarditis prophylaxis for highest risk patients (patients with prosthetic heart valves or previous infective endocarditis)[3]

Age group; years	Antibiotic	Route	Dose	After the procedure
Adults and children > 10	Amoxicillin and gentamicin	IV	2 g	1 g PO or IV, 6 h after procedure
		IV	1.5 mg/kg	None
Children < 10	Amoxicillin and gentamicin	IV	1 g	1 g PO
		IV	1.5 mg/kg	None
Adults and children > 10 allergic to penicillin	Vancomycin and gentamicin	IV	1 g	None
		IV	1.5 mg/kg	None
Children < 10 allergic to penicillin	Vancomycin and gentamicin	IV	20 mg/kg	None
		IV	1.5 mg/kg	None

Note: IV = intravenous; PO = oral.

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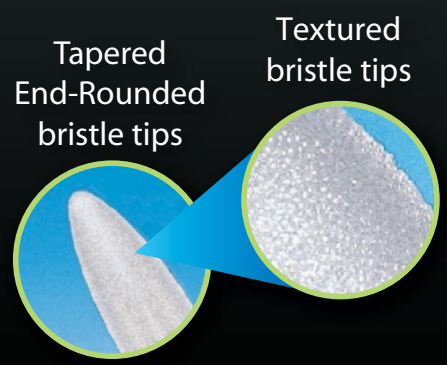

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Some Current Legal Issues that May Affect Oral and Maxillofacial Radiology: Part 1. Basic Principles in Digital Dental Radiology

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ABSTRACT

Developments in oral and maxillofacial radiology affect almost every aspect of dentistry: some change the legal framework in which Canadian dentists practise; some re-emphasize established standards of care, such as the dental radiologist's mantra, ALARA (using a dose that is as low as reasonably achievable) and viewing images in reduced ambient lighting. Developments in the legislation that regulates the use of radiology, such as Health Canada's Safety Code 30 for radiation safety in dentistry and the Healing Arts Radiation Protection Act, also affect the practice of dental radiology. Some technical developments, such as charge-coupled devices and photostimulatable phosphors, are already well-known to the profession. Teleradiology, currently used in hospitals, but unfamiliar to most dentists (especially those working in urban communities), may soon have an impact on dentistry when it is used for Canada's electronic health record, now under development. In this first of 2 articles about dental digital technology, we discuss the legal impact of developments in oral and maxillofacial radiology on dental practice and patient care.

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ALARA, or as low as reasonably achievable, is the oft-cited, still valid[1] mantra for protecting patients from exposure to too much radiation because no accepted minimum safe dose of radiation exists.[2–4] The most important way to reduce the radiation dose is to determine whether a clear clinical indication for each exposure exists,[5] and to make each exposure under optimal conditions, minimizing the need for repeated exposures.

In addition to the professional requirement that dentists use their skill and knowledge with due care and attention in the best interests of their patients at all times, various documents itemize what dentists are expected to do to minimize the radiation dose and thus the risk of damage to patients. These expectations are usually found in the codes of conduct issued by the provincial dental colleges. Contravention of these codes could lead to disciplinary and/or civil proceedings.

The provinces have various laws and regulations that minimize patients' exposure to radiation, contravention of which could result in administrative or even criminal proceedings in the truly grossest cases. Very few cases

of dental malpractice (negligence) have been reported in the Canadian Legal Information Institute's database of cases heard in superior courts. All seem to have arisen from unsuccessful treatment (silicone-based TMJ implant[6]) or some other matter such as limitation periods[7] and human rights (HIV patient refused treatment[8]). It is impossible to determine the impact that radiology has had on the vast majority of cases that were settled out of court or otherwise disposed of.

Dental regulatory bodies have qualified and controlled the extent of their members' practice, including radiology, unilaterally or with provincial legislation (e.g., British Columbia's Health Professions Act). One of the better-known pieces of provincial legislation that has had an impact on radiology in dental practice is Ontario's own rigorous regulations, the Healing Arts Radiation Protection (H.A.R.P.) Act,[9] which is consistent with Health Canada's Safety Code 30,[10] the federal government document that regulates radiation hygiene and practice in dentistry. This federal document has little legal force unless the provinces adopt it. However, only British Columbia has adopted it in its entirety.

One strategy to reduce the radiation dose is to use thyroid collars, which is required by law in Ontario and British Columbia; long position-indicating devices (formerly called cones); rectangular collimation; and faster-speed film (i.e., E or F speed). Another strategy is to convert to digital radiography.[11] In this first of 2 articles on dental digital technology, we discuss the legal impact of developments in oral and maxillofacial radiology on dental practice and patient care.

Going Digital

A number of recent publications provide an overview of digital radiology. Petrikowski[12] discusses its introduction to the dental office. van der Stelt,[13] Farman[14] and Kantor[15] explain and discuss the role of digital radiography in dental practice. Wenzel maintains an up-to-date list of old and new brands on her homepage (www.odont.au.dk/rad/).

Prospective buyers of a digital radiology system may be swayed by the apparent comparability between a particular digital system and intraoral film, the gold standard of dental radiology. One such point is spatial resolution. Similar to film, some systems now claim to be able to resolve in excess of 20 line pairs per millimetre.[16,17] However, the buyer must check that this resolution is real, not merely theoretical, especially for systems with lower spatial resolutions.

Dentists are presented with a bewildering array of detectors and receptors. Some guidance, however, can be found in the literature. For example, Farman and Farman[16] recently compared 18 detectors used in dentistry. Wenzel's current review of the literature[18] (which approached the rigour required for a systematic review[19]) reported a dearth of literature about new receptors that continually enter the market, likely because of the lengthy process of publishing reports about their accuracy and usefulness in international journals. Reports describing their clinical performance are also lacking, in part because in vivo studies are not suitable for evaluating diagnostic accuracy because their results cannot be confirmed with histopathology.[20] New detectors must undergo a laboratory accuracy test before any clinical use.

Legal Implications of Going Digital

The purported facility for fraud with digital radiology is no greater than that with analogue images.[21] Although there has been no legal ruling about digital dental images in malpractice cases, digitized fingerprints are admissible in criminal cases in the United States, and digital dental radiographs were admitted into evidence for identification purposes after the World Trade Centre and Oklahoma terrorist attacks, and the Columbia shuttle disaster.[22]

Since the image quality of radiographs used for identification purposes is not equivalent to that required for treatment planning, any system purchased for a dental office should be able to produce appropriate image quality and be completely secure. The system should prohibit erasure or alteration of images, other than the preprocessing that occurs automatically to deal with the effects of defective pixels.

Digital Display

Digital display must have the resolution to display digital radiographs of diagnostic quality to prevent misdiagnosis.[23] The criterion standard for image quality of the radiographic image is still film, particularly for spatial resolution,[15] when it is viewed on a standard illuminated viewer under reduced ambient lighting. Translation to digital technology requires similar viewing conditions, but must ensure that the monitor specifications are compatible with the optimal display of the image captured by the receptor.[24]

Copies

Because copies of radiographs can become a legal issue, hard copies of digital radiographs must be of diagnostic quality. That means that the software used must enable this process[24] and the printer must meet the technical standards set out by the National Electrical Manufacturers Association.[25] Moreover, the original analogue images, even if they are scanned, must be retained for legal purposes, since scanned or photographed copies do not produce images of diagnostic quality.[26]

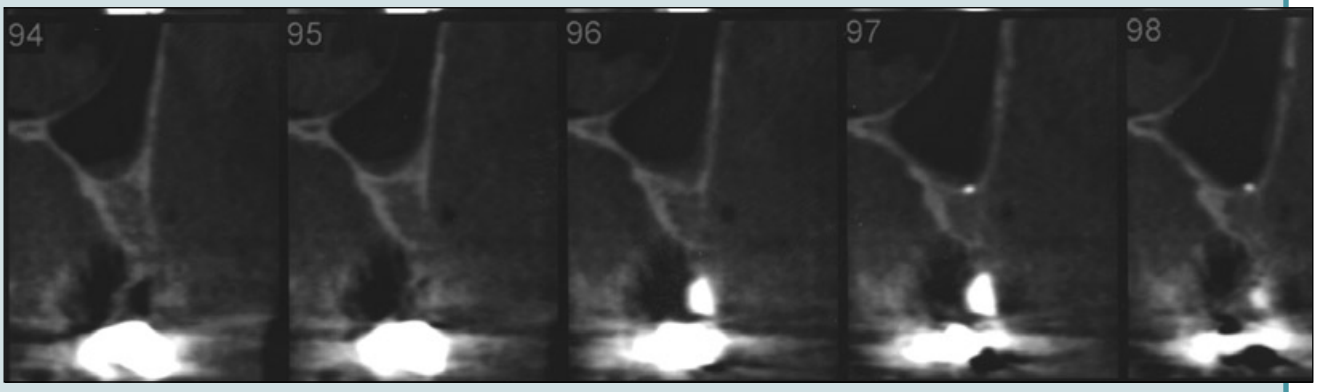

Figure 1: Cross-sectional images of a potential implant site made with a cone-beam computed tomography unit (iCAT). Note the stent placed on the edentulous gap on the upper left. The middle 5 consecutive cross-section images of the 30 sections through the edentulous ridge are shown. The images display marked variation in height and width, and degree of cortication over consecutive slices. The opacities on the crest of the ridge represent gutta-percha markers embedded within the stent. These markers help the surgeon translate the image to his or her patient. The stent ensures optimal placement of the resultant implant, both to minimize complications that arise from malpositioning, some of which are serious, and to ensure ultimately the fabrication of the restoration (a fixed bridge or removal overlay-style prosthesis).

Storage and Compression of Images

Adopting digital technology does not alleviate the problem of long-term storage of all analogue films. The length of time that records must be retained varies among the provinces: for example, Ontario requires retention of records for 10 years, whereas Nova Scotia requires their indefinite retention.[24]

Fundamentally, the storage of electronic dental records must accurately preserve the original content of the record (e.g., text, image or chart) and visual display.[24] The record must include complete information about the creation or any modification of the record (author, date, time and exact source of the record, such as workstation). The format must be read only and protected from unauthorized alteration, loss, damage or any other event that might make the patient information it contains inaccessible.

Although not much of an issue for a single practitioner, the storage of images may present a much greater challenge for a large group practice that uses cone-beam computed tomography (CBCT) data for implants and orthodontic cephalometry. Intraoral images account for only hundreds of bytes of storage and panoramic radiographs for only a few thousands. The very large image files required for CBCT data quickly exhaust even a very generous storage capacity.

Compression of image files is one alternative to acquiring more storage. Two systems are used for compression, lossless and lossy. CBCT iCAT (Imaging Sciences International, Hatfield, Penn.) files are automatically losslessly compressed, reduced to a third without loss of data. Lossy compression, however, involves an irrevocable loss of data. Although Eraso and others[27] reported that loss of image quality is not a factor unless the file size is reduced to 4% or less, research results are insufficient to recommend lossy compression for any image file. Fidler and others,[28] who systematically reviewed the literature on lossy compression, reported that the amount of information lost is difficult to express and standardize. Until lossy compression has been definitively tested, all data contained in an image file should be considered sacrosanct and should be preserved.

For CBCT, the best spatial resolution currently achievable is 0.1 mm voxel size, which is less than the spatial resolution necessary for detecting disease and the features that are observable on intraoral images. Observing these details for an appreciably larger field of view requires an increased radiation dose that may be comparable to that for a spiral computed tomography image (with poorer spatial resolution). When referring clinicians have clear clinical reasons for this greater resolution, this increased dose may be justified.

Imaging for Implantology

A position paper[29] by the American Academy of Oral and Maxillofacial Radiology recommends the use of cross-sectional imaging as part of preimplant planning (**Fig. 1**) to enhance successful outcomes and reduce the number and seriousness of complications. Cross-sectional imaging ranges from conventional tomography (preferably complex rather than linear motion, which is most likely to distort the image) through spiral computed tomography to CBCT. Failure to use cross-sectional imaging can result in complications, such as malpositioning of the implant into the inferior dental nerve or into the submandibular space, which is poorly tolerated and may

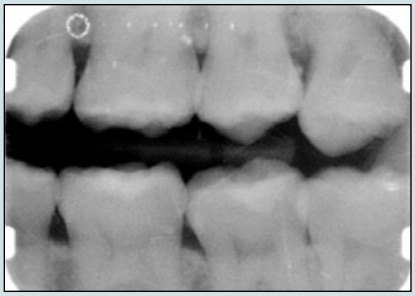

Figure 2: An image made on a photostimulatable phosphor (PSP) plate displaying widespread and severe damage to the PSP. This PSP should have been discarded long before it reached this state.

rupture the lingual artery, provoking a potentially life-threatening event. Placement of implants in the anterior arch can cause a substantial hemorrhage in the highly vascularized floor of the mouth and result in life-threatening airway events.[30]

Reduction in Chemical Hazards

Digitization can reduce chemical and environmental hazards, and may reduce the risk of damage that can lead to "occupier liability" suits. Digitization does not involve the use of processing chemicals, which are a potential health and environmental hazard, and digitization eliminates the need for removing and recycling silver.

However, digital radiography is not entirely free of solutions and disposables, as one might gather from the trade shows. To deal with the legal requirement for microbiological hygiene, appropriate disinfectants and barrier methods must be used.

Durability of Imaging

Photostimulatable phosphor (PSP) detectors should be considered semi-disposable to ensure that a legally adequate standard of image quality is maintained. Bedard and coauthors[31] determined that PSP detectors were so damaged after 50 uses that they should be replaced. **Figure 2** displays a severely damaged PSP, which should have been withdrawn from service. The image quality for PSP also requires that the exposed PSPs be loaded into the scanner in reduced ambient light in a dim room.[32] Akdeniz and colleagues[33] recommend that PSPs be scanned within 10 minutes of exposure to avoid loss of quality.

Integration with a Digitized Patient Record System

Integrating digital radiology with a digitized patient record system offers clear advantages: it streamlines office processes, enhances efficiency and minimizes errors, reducing the risk of legal liability.

Radiation Dose

Digital radiography is thought to routinely require less radiation than film to produce the same image; however, the reduction in radiation dose occasioned by changing to digital radiography may have been overstated.[13] Since it permits dentists to choose the image they prefer for diagnosis, it may require a longer exposure than that considered adequate for diagnosis. In a study comparing the radiation doses needed for the preferred image for digital radiography with those for E speed film, Berkhout and others[34] found that the reduction in dose may be minimal or none. Doses required for digital radiology are lower than those required for D speed film, which is still used by some dentists. However, the comparative ease of generating an immediate image, particularly with solid-state receptors (CCDs or CMOS), increases the number of retakes and thus increases radiation exposure.[35]

Teleradiology

Teleradiology should be defined as the formal transmission of images within a secure local area network and not as transmission by ordinary email. Email transmission is not secure, nor are the attached images diagnostic, particularly if they were lossy compressed. Teleradiology lacks standards for an interoperable, manufacturer-independent protocol for secure teleradiology,[36] and does not permit clients access to their images stored in the local area network's Digital Imaging and Communication in Medicine (DICOM) server.[37] Tachibana and others[38] designed a DICOM network-attached server (DICOM-NAS) that allows eligible clinical clients to access their images that are temporarily stored on the DICOM-NAS. Such temporary storage greatly improves security.

Although the physical record is deemed the property of the dentist, the information contained within it belongs to the patient. Therefore, any sharing of a patient's records, including images, with a third party, requires the patient's express consent.[39]

Canada Health Infoway has been commissioned to "develop a more integrated patient-focused system that tracks the patient's journey across the care continuum."[40] It plans to have an interoperable electronic health record in place across 50% of Canada, by population, by the end of this decade.[40] The electronic health record will contain diagnostic imaging elements that will reduce travel and archiving costs, delays in diagnosis and radiation dose by reducing redundant and repeat imaging. It will also facilitate expert interpretation and reduce the risk of missed pathology.[41]

Conclusions

Modern digital radiology, if clinically indicated and carefully executed, should minimize the legal hazards of dental practice. It should retain and store all captured images without loss of data, and minimize the scope for fraud.

Although medicine has used digital radiology without any appreciable legal repercussions, dentistry may not necessarily fare as well. Medicine, with a few exceptions, in particular mammography, which has only very recently become digitized,[42] does not require the high spatial resolution that is necessary for dentistry. This requirement has legal implications for dentists. Since they act as their own radiologists, they must display a high level of diagnostic acumen, and the technical specifications of their radiographic equipment must be at least the same, if not higher, than those of the equipment that medical radiologists use.

Until now, digital radiology has not been a major issue in dental cases heard in a superior court, where the use of digital radiology is most likely to be reported. This recent technical advance into an area that has been monopolized by medicine means that dentistry will be held to the generally accepted technical standards of the practice in medicine, sooner rather than later. These standards will affect not only the specifications of the detectors, but also the image display and CBCT (the principle subjects of part 2 of this 2-part series).

In addition to the issues discussed in this article, other issues could directly or indirectly have legal ramifications for dental practice. For example, manufacturers or their suppliers are usually required to apply for Health Canada's approval for each product, and provincial regulations and competent authorities may impose further restrictions. Therefore, careful inquiry of federal or provincial authorities should be made before the purchase any radiographic equipment.

THE AUTHORS

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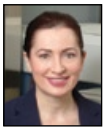

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A Review of Bisphosphonate-Associated Osteonecrosis of the Jaws and Its Management

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ABSTRACT

Bisphosphonate-associated osteonecrosis (BON) may result in serious oral complications, such as osteomyelitis and chronic exposure of necrotic bone. Dentists must be familiar with this disorder and pay special attention to all patients on bisphosphonate therapy due to their defective osteoclast function and reduced osseous tissue vascularity, leading to impaired wound healing. The purpose of this paper is to review the history and pathogenesis of BON, discuss its differential diagnosis, provide guidance to dentists on possible measures to prevent BON and review the management of patients with BON.

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Bisphosphonate-associated osteonecrosis (BON) is a serious oral complication of bisphosphonate treatment involving the exposure of necrotic maxillary or mandibular bone.[1] BON is a most disappointing complication as bisphosphonates have an otherwise tremendously beneficial effect on the quality of life of patients with boney metastasis and those with severe symptomatic osteoporosis.[2]

BON is a recently recognized clinical entity, and new cases are being reported daily. As such, epidemiologic data such as prevalence cannot be accurately reported at this time, but the cumulative incidence of BON from intravenous bisphosphonate therapy has been estimated to range from 0.8% to 12%.[3] However, with increased recognition of the condition, longer exposure to bisphosphonates and more follow-up, the reported incidence of BON is likely to increase.

Bisphosphonates are used in the treatment of osteopenic disorders as they have a high binding affinity with bone and interfere with osteoclast function, thereby slowing bone remodeling and turnover. Several types of bisphosphonates are in current use. Pamidronate and zoledronate are administered intravenously in patients with benign and malignant diseases involving excessive bone resorption, such as metastatic bone lesions of multiple myeloma and breast and prostate cancer. In pediatric patients, intravenous bisphosphonates are used in the management of osteogenesis imperfecta, idiopathic juvenile osteoporosis and osteopenic patients with juvenile rheumatoid arthritis who receive large doses of corticosteroids or methotrexate. However, unlike in adults, BON is thought to occur rarely, if at all, in children.[4–6] Alendronate and risedronate are administered orally and are mainly used in the treatment of osteoporosis and Paget's disease. BON has also been observed with oral bisphosphonate use.[7]

In patients at risk for BON, osteomyelitis and osteonecrosis may occur following dental procedures. Thus, an understanding of the role of the oral microbiota and impaired tissue healing following seemingly minor surgical trauma in the pathogenesis of BON is important to the dental practitioner, who must

Figure 1a: Lateral view of 55-year-old woman with a past history of intravenous bisphosphonate therapy for multiple myeloma with acute suppurative osteomyelitis of the right mandible.

Figure 1b: Anterior view of extensive acute facial swelling associated with suppurative osteomyelitis following intravenous bisphosphonate therapy.

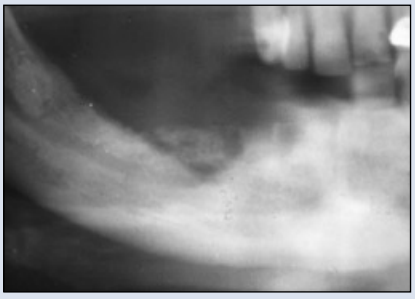

Figure 1c: Panoramic radiograph showing right mandibular osteomyelitis with sequestrum.

Figure 1d: Anterior view following incision and drainage with minimal debridement of tissue.

be vigilant in this setting to optimize oral health and prevent serious adverse sequelae. In this article, we review the important features of BON, including its pathogenesis, differential diagnosis, clinical findings and prevention, and provide management recommendations relevant to the dental practitioner.

Pathogenesis

Bone remodeling is a physiologically coordinated process involving bone formation by osteoblasts and bone resorption by osteoclasts. Imbalances between osteoblast and osteoclast activities result in skeletal abnormalities characterized by increases or decreases in bone density.[8,9] Although the exact mechanism of bisphosphonate-induced osteoclast inhibition has not been completely elucidated, the less-potent non-nitrogen–containing bisphosphonates are believed to induce apoptosis in osteoclasts through the formation of cytotoxic metabolites of ATP that accumulate and interfere with intracellular metabolic enzymes.[10] The nitrogen-containing bisphosphonates inhibit the mevalonate pathway.[11] Blocking the enzyme farnesyl diphosphate synthase creates an intracellular shortage of substances required for the post-translational lipid modification of small signaling proteins with GTPase activity and the resulting dysfunction hampers the regulation of osteoclast morphology and activity, leading to poor cell functioning and apoptosis.[12,13]

Recently, however, it has been suggested that bisphosphonates may inhibit osteoclast function without leading to apoptosis.[7] The potent antiangiogenic properties of bisphosphonates are also well known.[2,14] It may be the combination of inhibition of bone remodeling and decreased intraosseous blood flow caused by bisphosphonates that leads to BON.[14]

Osteonecrosis of the jaw, and often accompanying osteomyelitis, may be a serious consequence of the inability of the affected bone to meet the increased demand for repair and remodeling from physiologic stress (mastication), iatrogenic injury (dental extraction or denture irritation) or tooth infection in an environment that is trauma intense and bacteria laden.[15,16] The biologic potency of an individual bisphosphonate is related to its uptake and retention by bone. The effects of bisphosphonates seem to persist for prolonged periods, and this could explain why osteonecrosis appears after long-term treatment and even in cases in which bisphosphonate treatment has been discontinued.[2]

Clinical Presentation

Serious and previously unrecognized oral complications of bisphosphonate therapy may manifest as poor wound healing, spontaneous intraoral soft-tissue breakdown leading to intraoral bone exposure and bone necrosis in the oral and maxillofacial region[1] (**Figs. 1a–1d**). Although these complications may be seen in either the maxilla or mandible, the rate of occurrence is higher in the mandible.[2,3]

According to a recent position paper by the American Association of Oral and Maxillofacial Surgeons,[3] patients may be considered to have BON if they have a history of current or previous treatment with a bisphosphonate, exposed bone in the maxillofacial region that has persisted for more than 8 weeks and no history of radiation therapy to the jaws. Risk factors for the development of BON can be grouped as drug-related, local, demographic or systemic.[3]

Drug-related risk factors may include the potency of the particular bisphosphonate. For example, zoledronate is more potent than pamidronate, which is more potent

than the oral bisphosphonates.[2] The intravenous administration of bisphosphonates seems to confer a higher risk than oral administration. The duration of therapy is important, as longer duration appears to be associated with increased risk of BON development.

Local risk factors may include recent dentoalveolar surgery, such as extractions, dental implant placement, periapical surgery and periodontal surgery involving osseous injury.[3] Other local factors include local anatomy, such as lingual or palatal tori, sharp mylohyoid ridges and concomitant oral disease such as periodontal or dental abscesses (**Table 1**).

Demographic factors may include increasing age.[2] Cancer diagnosis has been found to be important; the risk of developing BON is greater among patients with multiple myeloma than among those with breast cancer.[3,4] The concurrent diagnosis of osteopenia or osteoporosis along with a cancer diagnosis is also a risk factor. Other risk factors may include corticosteroid therapy, diabetes, smoking, alcohol use, poor oral hygiene and chemotherapeutic drugs.[3]

Among patients taking oral bisphosphonates, the major risk factor is continuous bisphosphonate treatment for more than 3 years.[17] Other risk factors include corticosteroid therapy, diabetes, smoking, alcohol use, poor oral hygiene and widened lamina dura and sclerotic bone seen on dental radiographs.[17] Bisphosphonate exposure seems to render the bones of the jaws unable to respond to the stresses of infection or seemingly minor surgical trauma.

Symptoms in BON patients may be negligible, mild or severe and often occur after dental extraction, but might also occur spontaneously. The appearance of BON (**Box 1**) is identical to the appearance of osteoradionecrosis in patients who develop it after undergoing head and neck irradiation.[18] The most severe cases can cause intense pain, extensive sequestration of bone and cutaneous draining sinus tracts.[2,18] The exact reason for this complication is not clear, but the treatment of necrotic bone in BON is problematic and treatment issues are very similar to those in patients with osteopetrosis-related oral complications.

Histopathologic Features

Histopathology may reveal small nonvital bone fragments with bacterial colonies and an absence of inflammatory cells. Gram staining may reveal normal oral flora or, in cases of concomitant osteomyelitis, may include bacteria commonly found in osteomyelitis.[7,19] It has been suggested that bisphosphonate therapy could induce a condition similar to that found with osteopetrosis. The development of an osteopetrosis-like state has been described in a 12-year-old boy following an extended course of pamidronate therapy.[20]

Table 1 Assessment of risk of bisphosphonate-associated osteonecrosis in a patient

History of intravenous bisphosphonate therapy with:
Multiple myeloma
Metastatic bone disease with breast or prostate cancer
Osteogenesis imperfecta
Dental comorbidities
Active periodontitis
Dental caries
Dental abscesses
Failing root canal treatment
Any elective surgery in the oral cavity

Box 1 Common orofacial findings associated with BON

- Poor wound healing
- Spontaneous or postsurgical soft-tissue breakdown leading to intraoral or extraoral bone exposure
- Bone necrosis
- Osteomyelitis

Specific Laboratory Investigations

In addition to radiographic imaging, a complete blood count may help assess the state of the patient in terms of possible infection. Cultures of the infected bone tend to yield normal oral flora[2,18]; however, cultures of draining abscesses may be helpful in tailoring antibiotic treatment.

Assays to monitor markers of bone turnover, such as serum or possibly urine N-telopeptide (NTx) and C-telopeptide (CTx) levels, may help in the future diagnosis of BON.[21,22] NTx and CTx are fragments of collagen that are released during bone remodeling and turnover. Bisphosphonates reduce NTx and CTx levels. Monitoring of the risk of BON development through the various phases of bisphosphonate therapy may also be possible in the future using serum CTx levels,[21,22] which are thought to be reliable indicators, although they are subject to some daily variation.[17] Currently, testing for serum CTx levels is available at a few hospitals.

Differential Diagnosis

Patients who are at risk of BON or those with established BON may also present with other common clinical conditions not to be confused with BON. These conditions include, but are not limited to, alveolar osteitis (dry socket), sinusitis, gingivitis, periodontitis, caries, periapical pathology and temporomandibular disorders.[3] Some of these conditions, such as periodontitis, and

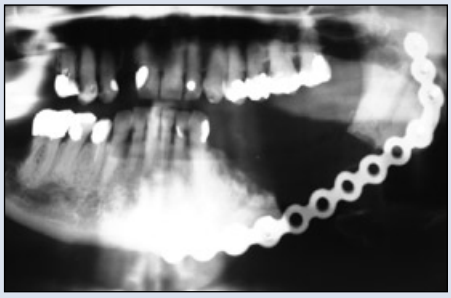

Figure 2a: Panoramic radiograph of dentition in a 70-year-old man with multiple myeloma and bisphosphonate-associated osteonecrosis following a palliative resection of the mandible with insertion of a reconstruction plate.

Figure 2b: The reconstruction plate has become exposed despite attempts to keep the wound clean. These wounds are inherently unstable and progressive die-back of tissue and continued exposure of bone and hardware may occur despite well-intentioned minimal wound debridements. All surgical interventions in these patients must be kept to a minimum. The role of salvage surgery is yet to be defined.

periapical pathology could also contribute to the development of BON in patients at risk.

Osteopetrosis may resemble BON, presenting with an area of denuded avascular bone. However, osteopetrosis can easily be differentiated from BON by its classic radiographic appearance and by the lack of history of bisphosphonate exposure.

Treatment and Prognosis

The management of BON of the jaws presents a challenge to dentists as there is no effective treatment for this condition at this time. Patients with asymptomatic exposed bone may be best treated with systemic antibiotics such as penicillin or clindamycin, an oral antimicrobial rinse such as chlorhexidine and close follow-up.[18,23]

Drug Holidays

Temporary interruption of bisphosphonate treatment can be considered in severe cases if the benefits outweigh the risks of skeletal-related events resulting from drug termination. Some patients may not be able to survive without bisphosphonate therapy. Others may develop further spontaneous fractures if bisphosphonates are discontinued. Improvements in BON may not be observed with drug discontinuation because measurable levels of bisphosphonates may persist in bone for up to 12 years after cessation of therapy.[24]

Conservative Therapy

Attempts at extensive debridement and local flap closure often seem to be unsuccessful and may result in even larger areas of exposed and painful infected bone.[3] The difficulty in treating this condition is that debridement cannot be carried out without potentially causing further bone exposure.[2,18]

A more conservative palliative approach may be the sequential removal of boney sequestra as required but, if more extensive debridement becomes necessary, the goal should be to remove as little bone as possible and, more important, to avoid disturbing the delicate overlying soft tissue. Gentle, frequent rinsing and irrigation with saline and antimicrobials is recommended to keep the wound clean.[25] The American Dental Association Council on Scientific Affairs recommends a focus on conservative surgical procedures, proper sterile technique, appropriate use of disinfectants and the principles of effective antibiotic therapy.[25,26] Removal of only symptomatic boney sequestra with minimal disturbance of overlying soft tissues along with topical and systemic antibiotics may be the treatment modality of choice at present.[23–28] Patients with draining sinuses, extensive areas of necrotic bone or large sequestra may require more extensive surgical procedures and their treatment course is typically protracted. In extensive cases where purulent exudates or sinus tracts are visualized, culture and microbial sensitivity testing may be warranted.

For many patients, complete healing may never occur and they must resign themselves to living with some degree of bone exposure. Management may then be limited to providing analgesia and controlling disease progression. There have been limited reports of salvage surgery where soft tissue coverage is attempted with transfers of vascularized tissue.[29] However, such extensive procedures may be precluded by the patient's otherwise debilitated condition (**Figs. 2a** and **2b**). Although hyperbaric oxygen therapy was first believed not to be effective in treating BON,[26] new evidence shows that it may hold some promise.[27,28]

Prevention and Dialogue

Due to the tremendous difficulty of treating BON, the focus should be on prevention. When intravenous or high-dose oral bisphosphonates are considered appropriate, close and ongoing communication between the dentist and the treating oncologist, endocrinologist or family physician is of paramount importance.[17] Complete dental assessment and treatment before the initiation of therapy should be considered.[3,14,25] If bisphosphonate therapy can be delayed, preventive surgery to eliminate

Table 2 Summary of Marx's protocol[17] and suggestions for patients on oral bisphosphonates who require oral surgery

Bisphosphonate use > 3 years
• Contact physician to discontinue bisphosphonate 3 months before surgery and for at least 3 months postoperatively, but preferably for 1 year. • Determine serum CTx level at time of consultation and immediately before surgery. CTx must be ≥ 150 pg/mL before proceeding with surgery. • Detail informed consent regarding risk of bisphosphonate-associated osteonecrosis (BON). • Use an alternative to bisphosphonate for long-term treatment, if possible.
Bisphosphonate use < 3 years with no clinical or radiographic risk factors[a]
• CTx level must be > 150 pg/mL. • Proceed with planned surgery but with informed consent regarding the increased risk of possible future BON with surgical treatment. • Establish a regular recall schedule; contact physician to discuss alternative treatment and intermittent drug holidays.
Bisphosphonate use < 3 years with 1 or more clinical or radiographic risk factors[a]

• Stop bisphosphonate therapy for 3-month drug holiday.
• If CTx level < 150 pg/mL,
  • delay surgery and stop bisphosphonate therapy for at least 3 more months
  • recheck CTx level 3 months later.
• If CTx level > 150 pg/mL then proceed with surgery.
• If CTx remains < 150 pg/mL then no surgery and check CTx level again in 3 months.
• 3-month drug holiday post-surgery.

Note: CTx = C-telopeptide.
[a]Steroid use, widened lamina dura or sclerotic bone.

potential sites of infection should ideally be performed before the onset of bisphosphonate therapy. Otherwise, any elective dental procedure requiring bone healing should be avoided.[3,14,25]

Once bisphosphonate therapy has been initiated, optimal oral health is an absolute must and all patients should be educated on the importance of good oral hygiene and regular clinical monitoring by a dentist. In addition, dental caries and periodontal disease should be controlled and denture stresses on mucosa should be minimized in edentulous or partially edentulous patients. It is also important for dentists to be aware of the poor surgical outcomes in patients receiving bisphosphonate treatment and to recognize poor wound-healing responses early. They should consider referring these patients to an oral and maxillofacial surgeon for even the most routine dental extraction. In general, the goal should be to keep the dentition in such a state as to be able to avoid future extractions.

Suggested Protocols

Marx[17] has suggested a management protocol for bisphosphonate patients who absolutely must have an oral surgical procedure. It takes into account the type and duration of bisphosphonate therapy, bisphosphonate discontinuance and CTx monitoring at the time of consultation and immediately before surgery. For a patient who has been taking an oral bisphosphonate longer than 3 years, serum CTx should ideally be checked at the time of consultation. The bisphosphonate would then be discontinued for 3 months before the procedure if approved by the patient's physician. Serum CTx would be rechecked at the time of surgery; CTx level should be greater than 150 pg/mL before proceeding with surgery. The patient would not take bisphosphonate for a further 3 months following surgery.[17] This protocol is further summarized in **Table 2**.

Conclusion

BON research is rapidly developing. Very recent studies such as the one by Mavrokokki and others,[30] which reviews the Australian demographics of BON, are important because they add to our understanding of this serious condition. This study found that 72% of BON cases occurred in patients with bone malignancies. In 73% of the cases, the main trigger was dental extraction.[30] A total of 114 cases of BON were reported of which 82 patients had a bone malignancy, 26 patients had osteoporosis and 6 patients had Paget's disease. All the patients with osteoporosis had been treated with oral bisphosphonates.[30] The frequency of BON in patients receiving bisphosphonate treatment for osteoporosis was 1 in 2,260. When extractions were performed on these patients, the frequency of BON was 1 in 296. For Paget's disease, the frequency of BON was 1 in 56 and with extractions, it was 1 in 7.4. In patients with bone malignancy, the frequency of BON was 1 in 87 and with extractions, it was 1 in 11.[30]

Special attention should be given to all patients on bisphosphonate therapy due to their defective osteoclast function and local tissue vascularity, leading to impaired wound healing. These patients should receive maximum attention to prevent dental problems and maintain their oral health. Preventive measures must be instituted before, during and after the treatment of patients taking bisphosphonates. Dentists should consider referring these

patients to a specialist for even the simplest necessary extraction or other dental surgical procedures to manage the serious adverse effects that may arise from oral surgery. Every effort should be made to avoid extractions or other elective surgical procedures in this high-risk group of patients until further clarification from long-term studies becomes available.

Future prospective trials and long-term follow-up in our local Canadian health care environment are necessary to determine future evidence-based recommendations that are relevant to the management of BON in the Canadian context.

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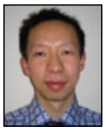

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Autotransplantation of a Supplemental Premolar: A Case Report

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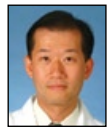

ABSTRACT

In this article, we describe the autotransplantation of a supplemental premolar to replace an extracted first permanent molar in a 12-year-old boy. Although the end results are not ideal due to the small size of the donor tooth, the esthetics and function of the dental arch are partly restored using a natural tooth rather than a prosthesis. This case report illustrates the usefulness of autotransplantation as a viable treatment option in children with missing permanent teeth.

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The replacement of missing permanent teeth in children can be challenging, as the growth and development of the oral structures need to be taken into account. In addition, the substitute should have the potential for long-term survival. Of the various replacement means, autotransplantation is a viable option.[1–4]

Autotransplantation involves the transfer of a tooth from its alveolus to another site in the same person.[5] The recipient site may be either an extraction site or a surgically prepared alveolus. Autotransplantation has been used in repositioning impacted teeth, in replacement of congenitally missing teeth or teeth lost due to trauma or dental disease and in replacement of teeth with poor prognosis.[5–8] Among these situations, replacement of first permanent molars that have been lost due to caries is common.[5,8–11]

First permanent molars are said to be the most caries-prone teeth in the permanent dentition.[12] Their early exposure to the oral environment and the presence of pits and fissures, which are less protected from fluoride than smooth surfaces, are contributory factors.[12,13] Late extraction of a first permanent molar will bring about marked mesial tipping and some lingual rotation of the second molar if the space is not restored.[13] Treatment options for the extraction space in a growing child may include replacement with a removable prosthesis, orthodontic space closure, use of the extraction space orthodontically to relieve crowding, or tooth replacement by autotransplantation.

A donor tooth chosen for autotransplantation should be of limited value in the dentition, e.g., a third molar,[5] a premolar in a crowded arch[1] or a supplemental tooth.[14] Supplemental premolars are relatively uncommon; their prevalence has been estimated to be less than 0.7%.[15] In this article, we report the autotransplantation of a supplemental premolar to replace an extracted first permanent molar.

Case Report

The patient was a 12-year-old boy with an unremarkable medical history. He was referred to the authors for management of an

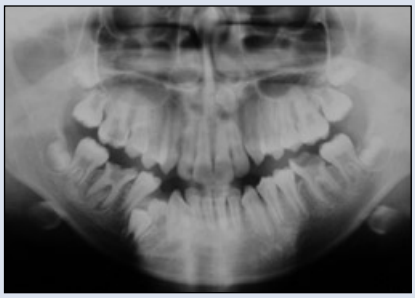

Figure 1: Orthopantomogram, taken when the patient was 11 years, 11 months of age, shows the presence of a premaxillary mesiodens and a mandibular right supplemental premolar.

Figure 2: Immediate postoperative view of the autotransplant stabilized with sutures.

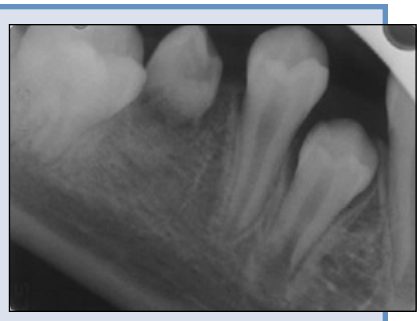

Figure 3: Periapical radiograph of the supplemental premolar taken 6 months after autotransplantation shows alveolar healing.

Figure 4: Periapical radiograph of the supplemental premolar taken 40 months after autotransplantation shows completed root growth with partial pulp obliteration.

Figure 5: Clinical view of the mandibular arch shows the autotransplant at the right side with acceptable alignment. Resorption of the alveolar bone is seen in the left extraction site.

impacted mandibular right first premolar. On examination, the boy was found to be in permanent dentition with the mandibular right first premolar and all third molars unerupted. Both his mandibular first permanent molars had been extracted by his referring dental therapist when the boy was 11 years, 11 months of age. The orthopantomogram taken at the time of extraction revealed an unerupted premaxillary mesiodens and a supplemental premolar impacted with the mandibular right first premolar (**Fig. 1**). Crown formation on the supplemental premolar was complete. The parents agreed that early removal of the supplemental premolar would be needed to facilitate eruption of the impacted first premolar. However, they preferred not to extract the mesiodens as it was deeply seated and not associated with pathosis.

Treatment options for spaces created by extraction of the first molars were explained. However, the parents and patient declined orthodontic space closure or removable prostheses as the cost of these treatments was not covered by the public dental service in which the patient was enrolled. Autotransplantation of the supplemental premolar to the mandibular right molar region was then proposed as a possible, although less desirable, option. The parents accepted this option and understood that some tilting of the second molar would still occur due to the size discrepancy between a permanent molar and the premolar. Undesirable tilting of the mandibular left permanent second molar could also be expected as the first molar space would be left untreated.

The autotransplantation was performed by the first author. Under local anesthesia, mucoperiosteal flaps were raised in the mandibular right first premolar and first molar areas. As partial healing of the first molar socket had occurred, the recipient site was prepared with a surgical round bur cooled with sterile saline. The supplemental premolar was carefully extracted, keeping the radicular part intact and untouched, and was transplanted to the first molar area without extraoral storage. The transplant was stabilized by black silk sutures, which were also used for wound closure (**Fig. 2**). The patient was prescribed chlorhexidine rinse and amoxicillin for 1 week. He was reviewed at 1 week, 1 month, 3 months

and then every 6 months (**Fig. 3**). Continued root growth was observed during this period, and there was no clinical or radiographic sign of root resorption.

The patient was last seen when he was 15 years, 4 months old. Radiographic examination revealed completed root growth, with intact lamina dura and partial pulp obliteration in the transplanted tooth (**Fig. 4**). The final crown-to-root ratio was close to 1, but the root structure appeared less radiopaque than in the adjacent premolars. The tooth responded positively to the ethyl chloride test and no periodontal lesion was seen. Initial caries lesions were seen on the proximal surfaces of the transplant and were treated by topical fluoride. The mandibular right first premolar had also fully erupted, but the second molar had tilted slightly mesially (**Fig. 5**). In contrast, a large gap was seen in the mandibular left first molar area with resorption of the alveolar ridge.

Discussion

High autotransplantation success rates have been reported in the literature. Andreasen and others,[2] who investigated the long-term prognosis of autotransplanted premolars for up to 13 years, reported 95% and 98% survival rates for teeth with incomplete and complete root formation, respectively. Autotransplantation is considered successful if there is no progressive root resorption, hard and soft periodontal tissues adjacent to the transplanted tooth are normal and the crown-to-root ratio is less than 1.[16,17] Using these criteria, Kristerson and Lagerstrom[16] evaluated 50 teeth autotransplanted to the maxillary incisor region after a mean period of 7.5 years and found an 82% success rate. Likewise, Tsukiboshi[7] reported an 82% success rate among 220 cases of autotransplantation after a mean of 6 years. Jonsson and Sigurdsson[18] followed 40 transplanted premolars for a mean period of 10 years, 4 months and showed a 93% success rate. In their long-term study of 33 autotransplanted teeth, Czochrowska and others[17] reported a 79% success rate after 17–41 years.

The factors that lead to successful autotransplantation have been extensively investigated. Although variations in the surgical protocol have been reported, the consistent message is the necessity for an atraumatic technique to preserve an intact periodontal ligament and Hertwig's root sheath in the donor tooth.[6] Pulp survival is also an important factor in root growth in immature teeth. An apical foramen diameter greater than 1 mm decreases the risk of pulpal necrosis after transplantation, and root resorption is more frequent in transplanted teeth with mature root development than in teeth with immature roots.[3] Although these findings indicate that greater success rates are achieved using teeth with immature roots for autotransplantation, teeth in the early stages of root development show less post-transplant root growth than those with more mature roots but incompletely formed apices.[4] As there is a possibility of no additional root growth after transplantation, it has been suggested that the donor tooth should preferably have at least three-quarter of the root formed and an apical opening more than 1 mm at the time of autotransplantation.[7] This is regarded as the best compromise to achieve a successful outcome in terms of root growth and healing of the periodontal ligament and pulp.[19] Transplantation of a fully formed root negates the potential for pulp regeneration, but adequate endodontic therapy will still ensure high survival rates.[2,7]

In the present case, the premolar was transplanted at a less than ideal stage of root development. However, the timing of the autotransplantation was governed by the urgent need to remove the supernumerary premolar and delayed removal might have compromised the eruption of the impacted first premolar. Autotransplantation using the third molars was not feasible at the time due to their early stage of development. As the first permanent molars had already been extracted when the authors first saw this patient, progressive resorption of the alveolar ridge was expected if treatment was delayed.[7,19] Partial pulp obliteration was observed in the transplanted tooth in this case, which is common in transplanted teeth showing pulpal healing.[3,18,20] The transplanted tooth was stabilized using sutures for 1 week postoperatively, as rigid long-term fixation of transplanted teeth may have adverse effects on periodontal and pulpal healing.[2,6,9] Although the use of antibiotics before and after surgery has been suggested by many authors,[1,6–10] antibiotics have not been shown to improve pulpal or periodontal healing.[2,3] In this case, the supplemental premolar was transplanted to a surgically prepared socket as partial healing had occurred after extraction. Although the success of autotransplantation depends mainly on the presence of vital periodontal ligament on the donor root surface,[6] a higher success rate has been found when a donor tooth is transplanted to an extraction socket immediately after extraction than when it is placed in an artificially prepared site.[7,19] In the latter case, healed periodontal ligament is less functionally aligned.[19] The periodontal ligament in the alveolar socket may also play a role in periodontal healing after transplantation.

The choice of treatment in this case was limited by financial constraints. Otherwise the management options for this case would have been:

1. No treatment of the extraction spaces. This would help maintain the centre line and increase the space for eruption of mandibular third molars.[21] However, as the first molars had been extracted after eruption of the second molars, space closure would probably have been incomplete with undesirable tipping of the adjacent teeth.[13]

2. Restoration of the spaces with a removable prosthesis. This option is relatively simple and could restore occlusal function and prevent space loss and overeruption of the opposing teeth. The disadvantages of a prosthesis are its tendency to retain plaque, the requirement for periodic replacement or adjustment as the child grows, its failure to prevent atrophy of the alveolar ridges, the laboratory fabrication cost and long-term maintenance cost.[22]
3. Orthodontic closure of the extraction spaces. This option eliminates the need for a prosthesis, prevents atrophy of the alveolar ridges, increases space for mandibular third molar eruption and provides the best esthetic and functional results.[13] The disadvantages are high cost and duration of treatment. Orthodontic closure of the space left by extraction of a first permanent molar can be technically demanding, although this is now greatly facilitated by additional anchorage provided by mini-implants.[23]
4. Autotransplantation of the supplemental premolar to restore 1 extraction site. This option only partly solved the problem as there was only 1 donor tooth. There was also a size discrepancy between the donor tooth and the extraction space. Nonetheless, this option restored 1 side with a natural tooth rather than a prosthesis. The transplanted tooth has a natural gingival contour, normal periodontal support and does not require long-term maintenance.[6] Although only 1 side could be restored, extensive centre-line shift to the untreated side is considered unlikely, as there would still be spacing around the transplanted tooth postoperatively due to it small size.
5. Implants and fixed prostheses are contraindicated in a growing child. Fixed bridgework may interfere with the growth of the dental arch, and implants are osseointegrated and would result in infraocclusion as the child grows.[7]

The parents of the child in this case chose option 4, as the treatment cost was covered by their public dental service. The overall treatment outcome is considered less than optimum, as the left extraction site was not restored and the final root length and root mass of the transplanted premolar were less than those of adjacent teeth. Donor teeth in an ectopic position before transplantation and those at an early stage of development will have reduced root growth.[4] In addition, the donor tooth in this case was a supernumerary and its root growth is unpredictable. The small size of the donor tooth allowed the adjacent second molar to tilt slightly mesially. The loose interproximal contacts with the adjacent teeth might also have contributed to the initiation of caries. Nevertheless, the treatment restored esthetics and occlusal function in the right side to a certain extent without the need for a prosthesis.

Conclusion

Autotransplantation can be a viable option in the replacement of missing permanent teeth in children. When space closure seems undesirable, autotransplantation of a donor tooth can restore the patient's dentition using a natural tooth rather than an artificial device. Clinicians who treat children should, therefore, keep this option in mind during treatment planning.

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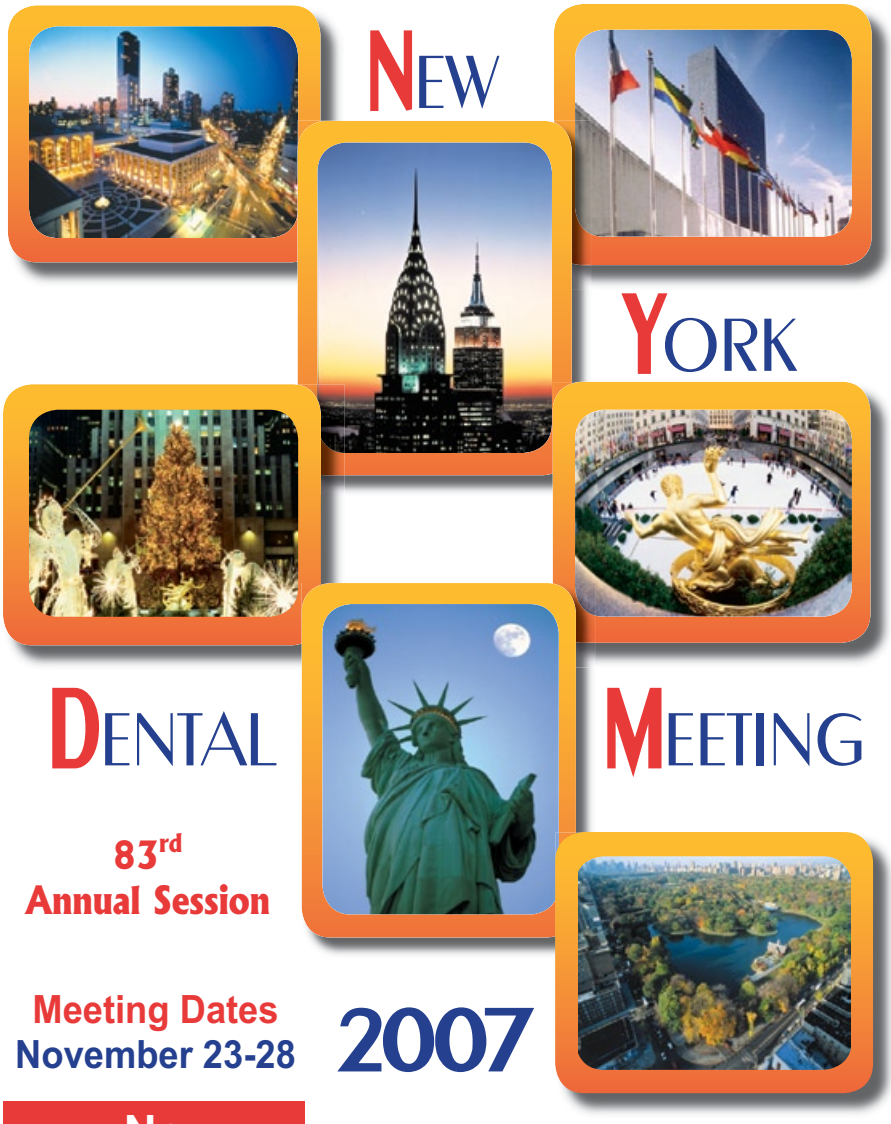

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Oral Soft Tissue Lipomas: A Case Series

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ABSTRACT

Objective: Lipomas are relatively uncommon tumours in the oral cavity; only 1% to 4% of cases occur at this site. In this study, we describe the clinical and histopathologic features of 6 cases of oral lipoma.

Materials and Methods: Between 1997 and 2005, the files for all cases of oral lipoma at the oral pathology division, University of Ribeirão Preto, São Paulo, Brazil, were retrieved for study. Clinical data were retrieved from patient records, and all cases were reviewed microscopically and classified.

Results: Of the 6 cases, 3 occurred in males and 3 in females; their mean age was 50.2 years (range: 28–78 years). Most cases affected the buccal mucosa and the mean size of the tumours was 3.0 cm (range: 1.5–5.0 cm). Microscopically, 4 cases were classified as lipoma, 1 as fibrolipoma and 1 as intramuscular or infiltrative lipoma. All cases had been treated by simple surgical excision and there had been no recurrence after a mean treatment time of 50.3 months (range: 8–72 months).

Conclusion: Oral lipomas are uncommon tumours that predominantly affect the buccal mucosa and are associated with an excellent prognosis.

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Lipomas are benign mesenchymal neoplasms composed of mature adipocytes, usually surrounded by a thin fibrous capsule.[1] They are the most common soft tissue tumour, and about 20% of cases occur in the head and neck region. However, only 1% to 4% of cases involve the oral cavity.[2,3] Oral lipomas represent 0.5% to 5% of all benign oral cavity neoplasms and usually present as painless, well-circumscribed, slow-growing submucosal or superficial lesions, mainly located in the buccal mucosa.[1,4] Imaging can be useful in the diagnosis and delimitation of oral lipomas. Recently, magnetic resonance imaging of a sialolipoma showed high intensity in the T1-weighted image and isointensity in the T2-weighted image.[5] Although oral lipomas are well-circumscribed soft-tissue lesions, rarely they give a radiographic impression of an intraosseous neoplasm within the mandibular canal.[6]

Microscopically, it is not possible to distinguish these lipomas from normal adipose tissue, despite their different metabolism (they are not used as an energy source as is normal adipose tissue), probably due to high lipoprotein lipase activity in neoplastic lipoma cells.[1,7] Based on their histopathologic features, lipomas can be classified as simple lipomas, fibrolipomas, angiolipomas, intramuscular or infiltrating lipomas, pleomorphic lipomas, spindle-cell lipomas, salivary gland lipomas (sialolipomas), myxoid lipomas and atypical lipomas.[3,4] As oral lipomas are

Table 1 Clinical features, histologic subtypes and follow-up for 6 cases of oral lipoma

Patient's age; years	Gender	Site of tumour	Size of tumour; cm	Duration of complaint; months	Histologic subtype	Follow-up; months[a]
54	F	Buccal mucosa	3.0	12	Lipoma	72
37	M	Buccal mucosa	3.0	NA	Lipoma	71
78	F	Buccal mucosa	2.0	NA	Lipoma	66
42	M	Lower lip	1.5	NA	Fibrolipoma	60
28	M	Buccal mucosa	3.5	24	Lipoma	25
62	F	Tongue	5.0	48	Intramuscular lipoma	8

NA = not available. In these cases, the patient did not know when they had noticed the tumour, reporting the presence of the tumour for several years.
[a]All cases were surgically treated and there were no cases of tumour recurrence.

relatively rare, few large case series have been published in the English-language literature.[1,8,9] The aim of this study was to assess the clinical and histopathologic features of 6 cases of lipomas located in the oral cavity and to discuss these features, as well as the differential diagnosis.

Materials and Methods

Between 1997 and 2005, among 2,270 cases of oral lesions diagnosed in the oral pathology division, University of Ribeirao Preto, São Paulo, Brazil, 6 cases (0.27%) were oral lipomas. All these cases were retrieved for this study. Clinical data, such as age and gender of the patient, site and size of the tumour, duration of the complaint, treatment and follow-up were obtained from the patients' records. All cases were reviewed microscopically and classified according to Gnepp.[3]

Results

The clinical features, duration of complaint, histologic subtype, treatment and outcome of the 6 cases of oral lipoma are summarized in **Table 1**. Three of the patients were men and 3 women, with a mean age of 50.2 years (range: 28–78 years). In 3 cases, the reported duration of the complaint varied from 12 months to 48 months (mean: 28 months). The other 3 patients did not know exactly when they noticed the tumour and simply reported that it had been present for several years. All patients complained of a painless nodule at the lesion site. The most common site was the buccal mucosa (4 cases), followed by the tongue (1 case) and lower lip mucosa (1 case). The size of the tumours varied from 1.5 cm to 5.0 cm (mean: 3.0 cm). Clinically, all cases presented as painless, well-circumscribed, submucosal nodules, with fibro-elastic consistency, yellowish colour and a covering of smooth mucosa (**Fig. 1**). All but the intramuscular lipoma were mobile; this lipoma exhibited diminished mobility. All patients were treated by surgical excision of the tumour with no recurrence after a mean time of 50.3 months (range: 8–72 months).

In gross appearance, the tumours were round, well circumscribed, elastic in consistency and presented a yellowish cut surface. Microscopically, 4 cases were classified as simple lipomas (66.6%), 1 as fibrolipoma (16.7%) and 1 as intramuscular lipoma (16.7%). Mature adipose cells, without atypias or necrosis, formed the simple lipomas. The fibrolipoma was composed of the same adipose cells, but they were surrounded by dense fibrous connective tissue (**Fig. 2**). Adipose neoplastic cells involving or infiltrating skeletal muscle cells were seen in the intramuscular lipoma (**Fig. 3**).

Discussion

Lipomas are adipose mesenchymal neoplasms; they are relatively uncommon in the oral cavity, representing about 0.5% to 5% of all benign oral tumours. Generally, their prevalence does not differ with gender, although a predilection for men has been reported,[8] and they occur most often in patients older than 40 years.[1,10] Although the mean age of the patients in the current study was 50.2 years and most were older than 40 years, 1 patient was 28 years old and another 37 years. The most common site for oral lipomas is the buccal mucosa (as in the current study), followed by the tongue, lips and floor of the mouth.[1–3] None of the tumours in our series affected the floor of the mouth. However, in view of the limited number of cases, this study may not reflect the true intraoral frequency distribution of lipomas.

Oral lipomas are slow growing, and patients commonly present with a well-circumscribed nodule that has been developing for several years.[1,11] Most of the patients in our series reported the presence of an oral lesion for a long time, although in 2 cases, the duration of the complaint (12 and 24 months) was shorter than the mean period reported in the literature.[1,11]

Clinically, oral lipomas generally present as mobile, painless, submucosal nodules, with a yellowish colour,[1]

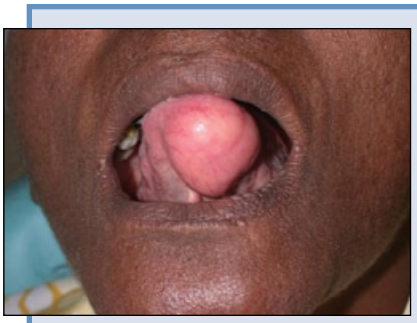

Figure 1: Painless, well-delimited, yellowish nodule located on the tongue.

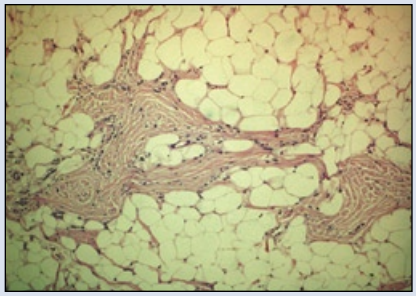

Figure 2: Adipose neoplastic cells surrounded by dense fibrous connective tissue characterizing a fibrolipoma (hematoxylin–eosin, original magnification ×100).

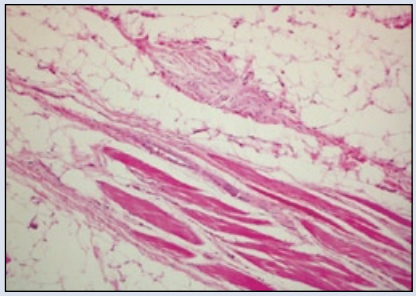

Figure 3: Tumour cells involving or infiltrating skeletal muscle cells in intramuscular lipoma (hematoxylin–eosin, original magnification ×100).

as observed in the current series. In some cases, oral soft tissue lipomas can present as a fluctuant nodule.[12] Because of these clinical features, other lesions, such as oral dermoid and epidermoid cysts and oral lymphoepithelial cysts, must be considered in the differential diagnosis of oral lipomas.[13] Although oral lymphoepithelial cysts present as movable, painless submucosal nodules with a yellow or yellow-white colouration, they differ from oral lipomas in that the nodules are usually small at the time of diagnosis and usually occur in the first to third decade of life. Also, most oral lymphoepithelial cysts are found on the floor of the mouth, soft palate and mucosa of the pharyngeal tonsil,[14] which are uncommon sites for oral lipomas. Oral dermoid and epidermoid cysts also present as submucous nodules and, typically, occur on the midline of the floor of the mouth.[15] However, oral dermoid and epidermoid cysts can occur in oral mucosa at other locations. Because an oral lipoma can occasionally present as a deep nodule with normal surface colour, salivary gland tumours and benign mesenchymal neoplasms should also be included in the differential diagnosis.[12]

The occurrence of multiple lipomas is associated with Cowden's syndrome or multiple hamartoma syndrome. This condition is either familial or sporadic and is associated with the predominantly postpubertal development of a variety of cutaneous, stromal and visceral neoplasms, resulting from mutations of the phosphatase and tensin homolog (PTEN) gene.[16] It can involve various organs, such as the skin, oral mucous membrane, thyroid, breast, ovaries and central nervous system. The most commonly affected extracutaneous sites are the breast and thyroid. Among the most common mucocutaneous lesions observed in people with this syndrome are small papular lesions in the palate and gingiva with up to 3 mm extension, which have a tendency to coalesce, papillomatous and verrucous lesions in the buccal mucosa, fissured tongue and cutaneous multiple lipomas.[17] Although multiple oral lipomas are rare in Cowden's syndrome, it should still be considered in the presence of multiple lipomas in the oral cavity.

Because of the histologic similarity between normal adipose tissue and lipoma, accurate clinical and surgical information is very important in making a definitive diagnosis. Thus, a clinician sending a surgical specimen for microscopic analysis must provide the oral pathologist with all available clinical and surgical information. Simple lipomas are the most frequent histologic subtype,[2,9,10] as we observed in the current study. But other authors have found equal incidences of lipomas and fibrolipomas,[1,18] although this is probably due to different diagnostic criteria.[1] In our series, the fibrolipoma consisted of adipose cells surrounded by dense fibrous connective tissue.

The other histologic subtype identified in this study was an intramuscular or infiltrative lipoma. In addition to the oral cavity, this variant usually affects the large muscles of the extremities in adult men; it is usually painless and characterized by infiltrating adipose tissue and muscle atrophy. At these sites, the recurrence rate after surgical resection is higher,[4] whereas, it rarely recurs in the oral cavity after complete removal.[4,10] Oral intramuscular lipomas show a slight predominance in the tongue and generally present as a not-well-circumscribed nodule.[1,10] The intramuscular lipoma of this series was located on the tongue, was well defined and did not recur after excision. Although intramuscular or infiltrative lipomas are recognized as a histologic subtype, there is speculation that they are simply lipomas with entrapped muscle fibres.[1]

The treatment of oral lipomas, including all the histologic variants, is simple surgical excision. No recurrence is observed.[1] Although the growth of oral lipomas is usually limited, they can reach great dimensions, interfering with speech and mastication[19] and reinforcing the need for excision. In the current series, all tumours were excised surgically, and no recurrence was observed after a mean of 50.3 months of follow-up.

Conclusion

Oral lipomas are relatively uncommon tumours; they have no gender predilection and they predominantly affect the buccal mucosa. Other lesions with similar clinical features can be considered in the differential diagnosis and clinicians must be able to recognize this oral lesion to carry out the correct treatment or refer the patient to a specialist. The most common histologic subtype is the simple lipoma. The ideal treatment is surgical excision, and no recurrence is expected.

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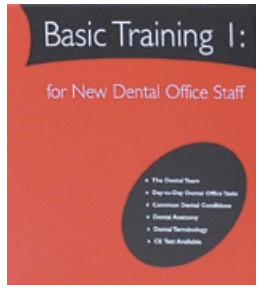

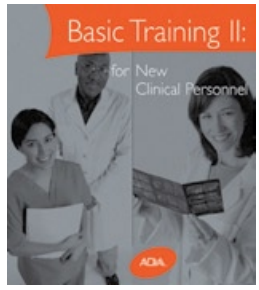

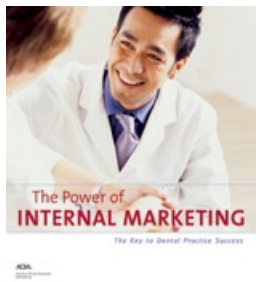

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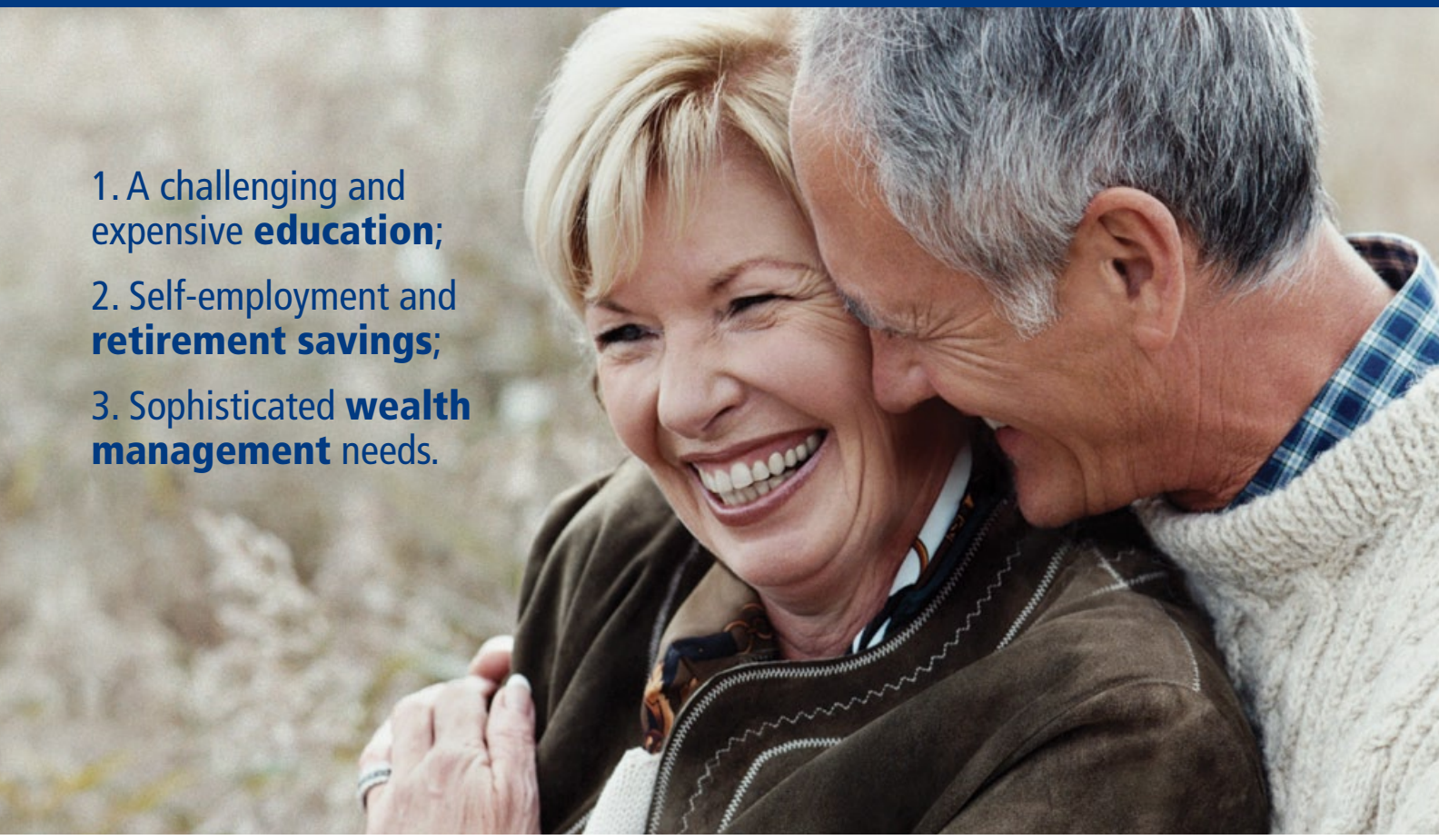

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Rapid Relaxation — Practical Management of Preoperative Anxiety

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ABSTRACT

Rapid relaxation (RR) is a brief set of suggestions, given while applying topical anesthetic, to reduce anxiety during local anesthesia and subsequent dental treatment. RR is recommended for managing mild dental anxiety, which is almost universal. RR combines elements of hypnosis, meditation and good basic chairside manner. It is noninvasive, takes little additional time, and empowers patients by providing them with an attractive, immediate alternative to catastrophization. We have found that RR markedly improves the quality of the dental experience.

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Dental anxiety or phobia is a common disorder that is challenging for both patients and practitioners to cope with; 11% to 22% of patients have extreme dental anxiety.[1] Dental anxiety has a negative impact on dental health.[2] People with severe dental phobia tend to avoid dental encounters until advanced dental disease necessitates emergency treatment, usually under general anesthetic. Those with moderate dental anxiety can usually be managed with sedative pharmacologic agents, administered intravenously or orally or by inhalation.[3] Although considerable evidence supports the use of behavioural interventions for lessening patient anxiety[4] and possibly mitigating practitioners' stress, the vast majority of patients with mild dental anxiety are treated without any formal attempt to manage their fear and anxiety.

Data suggest that many dentists have difficulty both identifying dental anxiety[5] and treating it effectively.[6] Stress before and during treatment elicits the stereotypical stress response, the fight-or-flight response. Characterized by increased sympathetic and central nervous system arousal, this response is most clearly manifested in an increased heart rate, diaphoresis and increased skeletal muscle activity.[7]

How can we help the majority of our dental patients better manage their immediate preoperative mild-to-moderate anxiety? Effective communication, persuasive ability and behaviour management are recognized as essential to ideal patient management,[8] yet these topics are rarely dealt with in any depth in dental or medical schools, which overwhelmingly emphasize pharmacological solutions.[9]

Do noninvasive relaxation techniques have proven benefits? Results of recent studies[10,11] in other disciplines examining the effect of relaxation techniques on postoperative pain and narcotic use have shown mixed results. However, consistently positive outcomes have been demonstrated in the domains that are particularly pertinent to the preoperative dental patient, including anxiety and patient satisfaction.[10,11]

Over the years, the senior author (J.L.) has developed a practical preoperative anxiety-management method, called rapid relaxation (RR). This technique involves condensing the essential elements of hypnosis and meditation into a very brief set of instructions. In this paper we describe what this technique entails, who will benefit from it, and how to use it to help reduce dental anxiety.

Patient Selection, Indications and Contraindications

A dental anxiety questionnaire can help the dentist assess patient anxiety levels. Although formal dental-fear assessments are rarely used in clinical practice, recently, a 20-item questionnaire called the Dental Fear Survey has been shown to accurately predict patient anxiety during treatment and is recommended for routine clinical application.[1]

The RR technique is ideally suited to the majority of patients who typically undergo dental treatment without premedication (anxiolytics, sedatives) or formal relaxation methods, yet suffer mild fear and anxiety before and during treatment. Evidence of preoperative stress ranges from patients stating that they are scared to exhibiting pallor, clammy hands, rapid shallow respiration, rapid pulse and muscular tension (**Fig. 1**). Even those who appear outwardly calm immediately before treatment should be asked if they are a little anxious. Often the response is affirmative. If the patient appears calm and claims to be relaxed, RR is likely unnecessary.

Patients need to be linguistically, intellectually and emotionally able to understand and follow instructions. A small proportion of more frightened patients seem to ignore the RR instructions. Some seem too frightened to be able to focus on the instructions, while others opt to use their own coping strategies.

Chairside Manner

Patients are primarily aware of clinicians' chairside manner — their calmness, gentleness and attentiveness — rather than their technical skill. Borrowing from hypnosis, clinicians should try to make sure that their tone of voice and body language are intentionally and consistently soothing, monotonous and congruent with achieving their goal of relaxing and reassuring the patient. Great care should be taken to choose words that will provoke the least anxiety (e.g., "a bit of discomfort" instead of "pain"). Offering a brief summary of what the actual dental treatment will entail can also help relax the patient.

The Rapid Relaxation Method

Ideally, RR instructions are given during the 2 or 3 minutes it takes to ensure profound topical anesthesia. When the patient is recumbent in the dental chair, generally with a dental assistant, and sometimes with one of the patient's relatives sitting nearby, we recommend following these 6 steps to help the patient overcome dental anxiety.

Figure 1: Tight gripping of the armrest is a common manifestation of muscular tension and fear.

1. The dentist should show the patient the reassuringly soft cotton-tipped applicator with topical anesthetic and say "This will first comfortably numb the surface," and then apply and hold the topical anesthetic in place.

2. Assessing the patient's overall body language is important. If the hands are clasped together, often pressing down on the solar plexus area, or firmly gripping the handrest, the dentist should say in a calm, slow, reassuring voice, "You might find it more comfortable if you let your arms rest loosely on the armrest." Selective, gentle humour, such as "Please be gentle with our equipment," when used in moderation, is sometimes appropriate and may lighten the mood. If the patient's legs are crossed at the ankles (some patients actively press the upper ankle down firmly on the one below), saying something like "You'll likely be more comfortable if you uncross your legs" may help. If the patient's eyes are open, the dentist could say, "You might find it more comfortable if you close your eyes — whatever's more comfortable for you."

Suggestions are less likely to evoke resistance than commands. Using the word "might" helps maintain an encouraging, rather than authoritarian tone. In our experience, no one has ever refused these instructions, nor complained after they were given.

The assistant and dentist should periodically recheck the patient's body language. When they observe raised shoulders, a frown or white knuckles, they should gently remind the patient to relax the specific area, and if appropriate, gently touch the area.

3. Describing a simple, brief technique for relaxing can be key. The script might unfold this way: "If you like, we'll show you how you can feel more relaxed. Scan your whole body, from head to toes, and look for any areas of tightness and tension in your muscles. As you know, this

Figure 2: A relaxed hand is an indicator of muscular relaxation and calmness.

'guarding' doesn't really help. Tight muscles only make you tired and tense. You can just let your muscles relax. Let them go — just like when you're really tired and you finally lie down in bed and feel your whole body sink into the mattress — allow your body to sink into the chair — completely relaxed, soft, floppy, like a baby or a puppy (**Fig. 2**)."

If the patient still seems anxious, having him or her concentrate on the breathing will help deepen the relaxation. Saying something like this may help: "Now that your body is nice and relaxed, you might notice that your thoughts are buzzing around like a mosquito, that you're worrying about the future — 'what if this, what if that.' You know that doesn't help either. It just makes you tired and anxious. A much better thing to do with your attention is to let it rest.

"A good place to let your attention rest is on the gentle feel of your breath at the bottom of your lungs. Allow your attention to rest on the subtle feel of your breath in your belt area. Each part of the breath, beginning, middle and end, feels subtly different, and every breath is slightly different. Let your attention rest on this subtle feeling."

If the patient's breathing is not reasonably slow and adequately abdominal, suggesting that he or she try not to control the breathing may help: "There's no need to try to control the breathing in any way. Just simply observe the subtle feel of the breath in your belt area. Breathing deep down to the base of your lungs is very efficient, so you can breathe much more slowly.

"You'll notice that your attention keeps drifting back to worrying thoughts. That's normal. Gently, patiently, keep bringing your attention back to the subtle feel of your breath in your belt area. Allow it to rest there peacefully."

4. Shortly before giving actual local anesthetic injections, the dentist may find it useful to prepare the patient by describing how he or she may react during the injection. For example, the dentist might say, "Normally when you feel a bit of discomfort, like the slight pinch from the injection, the tendency is to tighten up and hold the breath. As you know, that doesn't really help. It actually makes things worse. When your body stays relaxed and your breathing is smooth, you feel much less discomfort. So, as soon as you feel the slight pinch, let that be a signal for you to intentionally relax, and breathe through the discomfort." Continuing to encourage the patient during the injection by saying, "That's right, nice and relaxed, breathing through, very good" can also be helpful.

5. During treatment, the dentist should continue to reassure the patient about what may occur, by saying, for example, "Should you notice a bit of momentary discomfort, you immediately have a choice to either focus your attention on the discomfort or return all of your attention to breathing and relaxation, gently breathing through the momentary discomfort. As you already know, focusing on discomfort tends to magnify it out of proportion. Like most patients, you will likely choose to remain focused on breathing and relaxation, allowing the discomfort to quickly fade away." Patients need to remember that they are in control of the situation and that they have the ability to return their full attention to these techniques, thus minimizing any discomfort. If the patient suddenly stiffens and holds the breath during a momentary discomfort, interjecting a gentle reminder to "breathe through and relax" can help him or her refocus attention on relaxing.

Profound local anesthesia is, of course, a basic prerequisite. Nonetheless, anxious patients have a marked tendency to mislabel touch, vibration, smell, taste and sound as pain, and believe that their anesthesia is inadequate.

6. After the treatment is over, regardless of how well patients actually did, they should be congratulated on doing well. Encouraging them to practise these relaxation techniques will better enable them to relax in other stressful conditions. With practice, the mind is able to remain in a state of alert relaxation for longer periods of time, muscular tension is greatly reduced, breathing remains deep and relaxed, and a greater sense of calm prevails.

Discussion

Attention modification by focusing on the breath is a key element of sitting meditation as well as RR. As distracting thoughts or sensations arise, these are gently let go by repeatedly returning awareness to the primary object of attention, the breath. As the mind focuses on this object, tranquility ensues.[12] Attention to the breath in the base of the lungs helps stabilize abdominal breathing and elicits relaxation.[13] Theoretically, abdominal breathing induces relaxation at least partially because of direct stimulation of the phrenic plexus of the parasympathetic nervous system.

Focusing detailed attention specifically on the physical sensation of the breath anchors patients in their bodies and in the present moment, whereas anxiety takes them out of the present and into their fear of future events. Since complete or detailed attention can be on only one object at a time, anxiety-provoking thinking about the quality of breathing (e.g., its excessive rate, ineffectiveness) is displaced. Using RR, we attempt to guide patients to experience "the visceral embodiedness of every moment."[14]

The primary goal of RR is to keep the patient's attention anchored in the present, and to prevent catastrophization while being injected and, for a short time thereafter, while being treated. Anxious patients are in a catastrophization trance, triggered by exposure to the dental environment. The goal of both meditation and RR is to wake these patients from this trance so that they are able to respond appropriately to whatever is happening in the present, rather than inappropriately, based on past experience of traumatic events. RR, like meditation, trains the patient to tolerate the present experience and "not to let affect come tumbling in."[15] Both meditation and RR recognize how attention repeatedly drifts away from the focus of attention (e.g., the feel of the breath). The skill learned in both is that of persistently and patiently bringing attention back to the focus of attention. Attending to the ever-changing breath during RR literally links attention to each successive present moment, displacing anxiety and making dental treatment manageable, and at times, surprisingly pleasant.

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purchase and/or associate only, opportunities abound. Full-time or part-time associate(s) wanted for busy community-based practice, in ocean side Eastern Passage, Nova Scotia, only 12 km from downtown Dartmouth and 5 km from the Woodside Ferry. This is a family practice with opportunity to do all aspects of dentistry. Three fully equipped operatories, fully staffed; flexibility for hours of operation. For more information please contact Laurie Brown at work: (902) 464-4642, cell: (902) 488-3705, or email us at: zwickerdental@eastlink.ca. D3454

NOVA SCOTIA - Halifax: Full-time associate required for a very busy family practice. Position is to start immediately or spring 2007. Current associate has purchased a practice & will be relocating. Email: dentistassociate @yahoo.com or fax: (902) 443-5614. D2884

NUNAVUT - Iqaluit: Associate position(s) available for immediate start. Established clinic offers generous package and full appointment book to associates. All round clinical skills are your ticket to a wide range of recreational activities! No travel required and housing available in Canada's newest and fastest growing capital city. Please apply to: Administration, PO Box 1118, Yellowknife, NT X1A 2N8, or tel: (867) 873-6940, fax: (867) 873-6941. D1497

EASTERN ONTARIO - Hawkesbury: Part-time/full-time associateship in a busy family-oriented practice, 50 minutes from Ottawa or Montreal. Excellent staff (long-term) including hygienists, great environment and no weekends! For information, please email: drfb2709 @bellnet.ca. D3326

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ONTARIO - 20 Locations: Experienced associate required for our well-established, busy practice. Enjoy a small town or a large city atmosphere. For more information visit our website at: www.altima.ca or contact: Dr. George Christodoulou, Altima Dental Canada, Tel: (416) 785-1828 ext 201, or via email: drgeorge@altima.ca. D2690

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dandelion@northwestel.net D3484

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We are looking for an associate to join our well-established practice located in sunny southern Alberta. The office operates weekdays 8am to 4pm with 1 dentist, 2 hygienists, 3 assistants, and an administration team. This well managed office has growth potential and sustainability, welcoming on average 45 new patients monthly. Our beautiful newly constructed 7-operatory clinic is located in the city center servicing a population base of 150,000. Lethbridge is a vibrant growing city that boasts all the conveniences of a large city while maintaining a friendly, small town feeling and a low cost of living. The primary dentist would like to reduce his hours and allow the associate the opportunity to become a substantial part of the practice. For the right individual this will be a wonderful opportunity. New grads welcome. For more information contact:

Dr. Harold Elke at (403) 320-0033,
or email: integritydental@shaw.ca.
View our webpage at www.integritydental.com.

D3392

ONTARIO - Midland: We are seeking a full-time experienced associate to join our busy practice. We are looking for someone with excellent communication skills with a patient-focused approach, and comfortable in most aspects of general dentistry including surgery, pedodontics and endodontics. Our current associate is moving out of the area. Located on beautiful Georgian Bay. Contact Don Farquhar at: dr.don@huroniadental.ca. D3343

ONTARIO - Ottawa: Associate dentist wanted. Searching for a people-oriented dentist seeking to associate with the opportunity of becoming a partner. Please phone: (613) 526-3535 or fax resume to: (613) 526-1515. D2557

ONTARIO - Ottawa: Looking for a motivated associate for full-time employment. Full patient load. Evenings and some Saturdays. Modern and progressive office. Excellent opportunity for new graduate. Please contact Dr. Gillian Espie: Tel: (613) 596-6404. Fax: (613) 596-6531 or email: lincdent @rogers.com. D3566

ONTARIO - Ottawa: Associate (part-time leading to full-time position) - seeking a dynamic, dedicated, team-oriented individual to join a large, well-established group practice in Kanata (Ottawa) Ontario. Please call Catherine or Rebecca at: (613) 592-2900 Monday to Thursday between 8 am and 3 pm or submit resume either by fax: (613) 592-4028 or email: hazeldean@bellnet.ca. D3468

ONTARIO - Ottawa: 20 min. à l'est d'Ottawa, clinique dentaire achalandée à la recherche d'un(e) dentiste à temps plein. Pratique multidisciplinaire bilingue. Dentistes propriétaires prêts à partager leur expérience avec jeune diplômé(e) S.V.P. Faxer votre CV au : (613) 446-5006. D2792

ONTARIO - St. Catharines: Full-time/part-time associate position available in a well-established family practice located in a high profile shopping centre. No weekends. Some evenings. New grads welcome. Position to start summer/fall 2007. Current partner/associate retiring. Please fax resume to Dr. Watts: (905) 688-0557 or email: twatts54@cogeco.ca. D3443

ONTARIO - St. Thomas: Immediate start for an associate to provide optimum patient care in our private practice. Applicant should be confident and skilled in all aspects of dentistry. Full-time position and flexible schedule. Opportunity to work under the guidance and experience of a well-established dentist of 23 years. All resumes are welcome by mail: 127 Curtis Street, St. Thomas, ON, N5P 1J4 or fax: (519) 631-1962. D3561

ONTARIO - Toronto: A great full-time opportunity is available to join 2 practitioners in a modern, progressive pediatric dental office with an on-site general anesthesia facility and hospital time. Guaranteed minimum daily net. Future buy-in available. Fax resume to: (905) 513-7833. D2167

ONTARIO - Toronto: Part-time associate required for downtown practice in Toronto, Ontario. Contact fax: (416) 960-3298 or email: kacinik@inter log.com. D2928

ONTARIO - West of Toronto: Part-time associate for 7-month maternity leave (as of Sept. 1st/07). Busy and fully booked on day one, you will have the opportunity to practise dentistry in a well-established practice that thrives from a positive environment and a foundation based on values. You will be exposed to such areas as cosmetics, implants, Cerec technology and more. Please fax: (905) 846-9095. D3475

ONTARIO/QUEBEC - Cornwall & Hawkesbury: Choose the location you want, very busy practices. In Quebec, only 30 minutes southwest of Montreal. Full schedule (crown bridge, endodontics etc.). Possible sale. Outstanding growth income. Stability, flexibility and respect assured! For further information call Luc at: (450) 370-7765 or at: lucleboeuf291 @hotmail.com. D1674

PRINCE EDWARD ISLAND: Oral maxillofacial surgeon. Opportunities available for associateship leading to partnership in all aspects of busy oral surgery practice in Atlantic Canada. Hospital privileges available. If interested please reply to: CDA Classified box #1548. Tel: (902) 892-2970 (bus.), (902) 892-8337 (res.), email: habbi@ islandtelecom.com. D1548

SASKATCHEWAN – Regina: Gardiner Park Dental is a progressive newly renovated practice in a city that is enjoying growth and prosperity while offering a lifestyle that is very affordable for a young professional. Our well-established practice has 11 chairs, intraoral cameras, Biolase lasers and digital radiography. A former partner has left for graduate school and a position is available for a highly motivated dentist with a commitment to continuing education, customer service and delivery of excellent dentistry. Two partners are looking for a third dentist to contribute to our team of 4 dental hygienists, 7 registered dental assistants and a supportive and proactive front end team. The successful candidate will have the opportunity to purchase ownership in this highly successful and lucrative practice. Please call: (306) 789-2330. Fax: (306) 789-1822, or email: drslarzig@sasktel.net. D3569

UNITED STATES: Outstanding opportunities across the country for new and seasoned general dentists and specialists. For details contact: Gretchen Neels, tel: (781) 224-0880 ext. 209, or email: gneels@amdpi.com. D1846

UNITED STATES - Illinois, Texas, and Georgia: A unique and exciting opportunity is available for general dentists in the U.S. Earn between 250-350K per year with paid malpractice and health insurance while working in a great environment. The group is owned and operated by Canadians and will look after all immigration needs. Need to have completed US Boards Parts 1 and 2. Email: dwolle@gmail.com, fax: (312) 274-0760. D2456

YUKON - Whitehorse: Full-time hygienist required immediately for busy practice. Great office, wonderful staff and patients. Live in the great north & enjoy all that it has to offer. One job you will never regret, don't let this pass you by. Phone: (867) 668-2273 or email: pinedental@northwestel.net. D3533

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Equipment Sales & Service

FOR SALE: Renovation sale. Sordex Cranex 3+ Panorex machine year 2000, price $23K asking $6,995.00. Macan MC-6 Electrosurge unit with 5 sterilizable insert tips year 2000, price $3,071.00 asking $800.00 & Gendex GXP X-ray Processor year 2000, price $6,600.00 asking $1,995.00. Please email request for photos to: drznath@cablerocket.com or phone: (780) 624-2004. D3520

FOR SALE: Quint Sectograph Linear Tomography x-ray machine for skull/jaw/TMJ imaging. Includes grids, cassettes, filters, imprinter, duplicator, safelight. $12,000. Fuji RG II automatic x-ray film processor with automatic replenishing tanks. Can take 14" films. $1,200. Contact: equip4sale@shaw.ca. D3365

FOR SALE: Defibrillators - Sam Pads - by Rescue 7 Inc. CDA special $1,650 includes AED, carry case, 2 sets of pads, 2 batteries, poster, AED window sign, user manual, 7 year warranty! Rescue 7 is the exclusive national distributor. Can provide training and other equipment - O2, emergency kits. Michele VanHee: 1-888-294-4208 or michelevanhee@rescue7.net. D3604

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Evidence-based Treatment of Periodontal Disease
AGD Mastertrack/Fixed Prosthodontics
Advanced Endodontics
Guided Implant Surgery
2007 AGD Annual Meeting & Exhibits ~ June 27-July 1, 2007, San Diego, Calif.

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CDA Fund Performance (for period ending April 30, 2007)

	MER	1 year	3 years	5 years	10 years
CDA Canadian Growth Funds					
Aggressive Equity Fund (Altamira)	1.00%	7.7%	12.3%	13.8%	9.9%
Common Stock Fund (Altamira)	0.99%	13.1%	16.3%	11.2%	9.5%
Canadian Equity Fund (Trimark)	1.50%	14.7%	13.1%	9.0%	8.4%
Dividend Fund (PH&N)†	1.20%	15.3%	14.6%	12.3%	15.5%
Income Trusts Fund (Sceptre)†	1.45%	7.5%	19.6%	17.9%	n/a
Special Equity Fund (KBSH)	1.45%	-1.2%	13.6%	9.6%	9.9%
TSX Composite Index Fund (BGI)††	0.67%	12.0%	19.2%	13.4%	9.7%
CDA International Growth Funds					
Emerging Markets Fund (Brandes)	1.77%	20.4%	17.2%	15.5%	6.3%
European Fund (Trimark)†	1.45%	30.8%	14.2%	2.8%	5.2%
International Equity Fund (CC&L)	1.30%	14.5%	5.9%	0.8%	3.3%
Pacific Basin Fund (CI)	1.77%	5.8%	7.0%	2.7%	1.0%
US Large Cap Fund (Capital Intl)†	1.46%	5.7%	1.3%	-0.6%	n/a
US Small Cap Fund (Trimark)	1.25%	15.1%	12.1%	n/a	n/a
Global Fund (Trimark)	1.50%	23.7%	10.5%	6.6%	9.8%
Global Growth Fund (Capital Intl)†	1.77%	13.0%	10.8%	n/a	n/a
S&P 500 Index Fund (BGI)††	0.67%	12.5%	3.3%	0.6%	4.9%
CDA Income Funds					
Bond and Mortgage Fund (Fiera)	0.99%	3.8%	2.5%	4.4%	4.9%
Fixed Income Fund (McLean Budden)†	0.97%	6.0%	4.5%	5.5%	6.1%
CDA Cash and Equivalent Fund					
Money Market Fund (Fiera)	0.67%	3.6%	2.5%	2.4%	3.2%
CDA Growth and Income Funds					
Balanced Fund (PH&N)	1.20%	10.4%	8.9%	6.1%	6.5%
Balanced Value Fund (McLean Budden)†	0.95%	10.6%	9.1%	7.2%	8.1%
CDA Managed Risk Portfolios (Wrap Funds)	**MER**	**1 year**	**3 years**	**5 years**	**10 years**
Index Fund Portfolios					
CDA Conservative Index Portfolio (BGI)†	0.85%	7.9%	7.0%	5.8%	5.9%
CDA Moderate Index Portfolio (BGI)†	0.85%	11.6%	10.1%	7.7%	7.3%
CDA Aggressive Index Portfolio (BGI)†	0.85%	15.1%	12.9%	9.0%	7.8%
Income/Equity Fund Portfolios					
CDA Income Portfolio (CI)†	1.65%	8.1%	7.3%	7.3%	n/a
CDA Income Plus Portfolio (CI)†	1.65%	9.0%	9.6%	8.5%	n/a
CDA Balanced Portfolio (CI)†	1.65%	10.5%	11.8%	8.8%	7.7%
CDA Conservative Growth Portfolio (CI)†	1.65%	10.8%	n/a	n/a	n/a
CDA Moderate Growth Portfolio (CI)†	1.65%	11.2%	10.5%	n/a	n/a
CDA Aggressive Growth Portfolio (CI)†	1.65%	12.3%	n/a	n/a	n/a

Figures indicate annual compound rate of return. All fees have been deducted. As a result, performance results may differ from those published by the fund managers. CDA figures are historical rates based on past performance and are not necessarily indicative of future performance.

† Returns shown are for the underlying funds in which CDA funds invest.

†† Returns shown are the total returns for the indices tracked by these funds.

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