



# JCDA

Journal of the Canadian Dental Association

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### Access and Care: Towards a National Oral Health Strategy — Report of the Symposium

Ruth R. Armstrong, MBA

## DEBATE

### A Professional Psychologist and Dental Phobic Speaks

John Harvey, MA, MDiv, LPsych

## PROFESSIONAL ISSUES

### Prevalence of Caries among Preschool-Aged Children in a Northern Manitoba Community

Robert J. Schroth, DMD, MSc; Pamela J. Smith, PhD; Jeanne C. Whalen, MSc; Charles Lekic, DDS, PhD; Michael E.K. Moffatt, MD, MSc, FRCPC

### Decreases in Occupational Exposure to Ionizing Radiation among Canadian Dental Workers

Jan M. Zielinski, PhD; Michael J. Garner, MSc; Daniel Krewski, PhD; J. Patrick Ashmore, PhD; Pierre R. Band, MD; Martha E. Fair, MSc; Huixa Jiang, PhD; Ernest G. Letourneau, MD; Robert Semenciw, MSc; Willem N. Sont, PhD

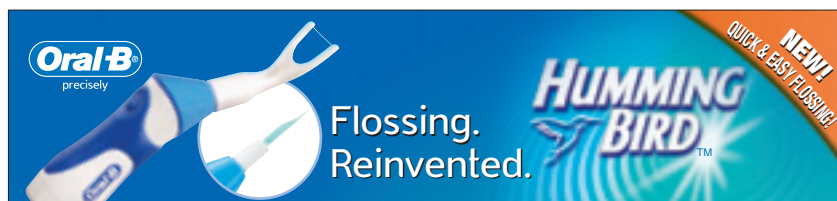
### Foil Backing Used in Intraoral Radiographic Dental Film: A Source of Environmental Lead

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# Editorial

## REACHING OUT AND BROADENING MINDS



Dr. John P. O'Keefe

**D**r. Robert Kriegel, author of the book *Sacred Cows Make the Best Burgers*, suggests that companies need to kill their “sacred cow,” pre-conceived notions in order to innovate and thrive in an increasingly competitive marketplace. I believe we will need to use similarly radical thinking to address the pressing issue of ensuring access to adequate oral health care for all Canadians.

While most of our compatriots have access to high-quality care, many with low incomes, increasing numbers of seniors and some in isolated rural areas have difficulty accessing care. I believe that the dental profession has a responsibility to show leadership on this issue and needs to work with different groups, in different ways, to bring about progress. In this vein, representatives from various organizations came together at the University of Toronto last May, with the strong encourage-

ment of Dean David Mock, to grapple with this thorny problem.

A summary of the main discussions and recommendations that came out of the Toronto symposium is published in this edition of *JCDA*. Ruth Armstrong's article is one of a series of reports from the symposium that we are publishing. While you may find some of the ideas expressed by the participants to be outside your comfort zone, I contend that we need to celebrate the fact that these people came together to examine what I think is currently our profession's biggest political issue. The creativity shown by symposium participants may point the way towards solutions, some which deviate from mainstream thinking.

I am not alone in according so much importance to the access issue. I recently interviewed Dr. Bob Brandjord, president-elect of the American Dental Association (ADA). When I asked him to identify the major political issues facing ADA, he unhesitatingly said that providing access to oral health care for underserved Americans, many residing in rural areas, is at the top of the list. His assertion is borne out in a freely available white paper on access to care produced by the ADA in October 2004.

Dr. Brandjord spoke with great pride of the rural clinical outreach program run by the faculty of dentistry at his alma mater, the University of Minnesota. This program, which has run successfully for many years, brings dental students off campus to provide care in underserved areas of the state. A major factor in the success of the program, according to Dr. Brandjord, has been a flourishing partnership between the dental school and the dental profession in Minnesota.

On a recent visit to Edmonton, I learned that Associate Dean Ken Zakariasen of the University of Alberta faculty of medicine and dentistry was

formerly part of the management team of the University of Minnesota dental outreach program. He has brought his enthusiasm for rural outreach to his new job and he spoke excitedly about plans for developing the University of Alberta dental student rural outreach program, which I had the chance to visit last year.

My observations of the Alberta program were very favourable and I believe it is a model that may be worth developing further and emulating elsewhere. While it currently provides a solution to a very small part of the rural access problem, the program could benefit other underserved rural communities if it were expanded. Dental students need to practise their clinical skills and rural outreach clinics provide no shortage of interesting patients.

Patients in rural areas need care and there is anecdotal information about the increasing difficulties in convincing graduating dentists to purchase a practice or become associates in many parts of rural Canada. Exposing more students to the rural lifestyle has the potential to attract them away from major cities once they graduate. Fortunately, the Alberta dental outreach program is housed in a faculty keen to place an even greater emphasis on developing a wide range of rural health education and service initiatives.

Surely the time is right for interested parties from different sectors to work together to expand programs like this. Having more students involved in the community throughout the school year may allow more Canadian students to be admitted to enhanced “dental schools without walls.” I didn't see too many sacred cows during my time in Alberta.

John O'Keefe  
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# President's Column

## EVERYTHING OLD IS NEW AGAIN



Dr. Alfred Dean

With a slight air of nostalgia as 2004 drew to a close, I sat down to comb through some old copies of the *Journal of the Canadian Dental Association*. I was curious to see what the topics of concern were some 25 to 30 years ago, well before I graduated from Dalhousie University. This exercise produced surprising results, as I quickly realized that organized dentistry continues to wrestle with many of the same topics today. Allow me to take you on a tour down memory lane.

If we travel back to 1968, Pierre Trudeau was pirouetting into power in Ottawa and Montreal was celebrating its new professional baseball franchise, rather than seeing it return to the U.S. That same year saw CDA coping with 4 successive budget deficits and appealing to its members for understanding. Compare this to today when CDA has accomplished at

least 4 consecutive balanced budgets, thanks in part to solid fiscal management by your Board of Directors.

In 1968, the Association was concerned that after several years of inaction the federal government had not responded to CDA's call for more professional training grants to help dentists prepare for teaching at university. This initiative was in response to a need for 200 extra teachers, as dental schools were preparing for increased enrolment in the coming years. CDA cautioned that "the looming teacher shortage is so serious that it is inadvisable to ignore it" (November *Journal*, p. 516). This sounds remarkably similar to our current dictum, "No Professors — No Profession." Faculty shortages are part of the current crisis in dental education and CDA continues to broach this topic with government, most recently at our 2004 "Days on the Hill" meetings.

In the 1960s, the profession was concerned about a shortage of dental manpower in Canada. During that decade, we successfully lobbied governments to increase the capacity to produce dentists. However, by 1981 the situation had reversed itself and the new concerns were centred on a perceived oversupply of dentists. Regrettably, the profession again finds itself in the position of convincing government of the precarious situation of our dental faculties, a consequence of sustained years of government underfunding. This past November, CDA organized an Academic Summit as part of our commitment to provide assistance to the academic community.

Moving to February 1969, CDA met with representatives of the provincial associations to discuss, "status, rights and duties of the corporate members; composition, power and duties of the Board of Governors and the Executive Council...and the composition and duties of CDA

councils, committees and sections" (April *Journal*, p. 169). Such concerns echo CDA's major governance and committee restructuring in recent years, which is aimed at making the Association more flexible and nimble in our new knowledge-based decision-making framework.

If we jump ahead to 1981, Pierre Trudeau was still smelling the roses as prime minister. In June, the nation mourned the courageous Terry Fox, who succumbed to cancer.

That same month, the CDA Taxation Committee convened to review individual pension plans with their counterparts in the Canadian Bar Association, the Canadian Medical Association and the Canadian Association of Chartered Accountants. This collective investigated the right for self-employed professionals to create tax-sheltered pension plans. While RRSPs are now a mainstay of the modern dentist's retirement portfolio, CDA continues to work on this issue, pressing the government for increases in personal contribution limits, as evident in our active involvement with the Retirement Income Coalition.

What does this recurrence of issues in dentistry mean? It should not imply that nothing has changed and that the efforts of successive regimes of CDA leadership has been all for naught. Rather, it shows that we must continue to address these issues to ensure improvements in our members' standard of living while sustaining dentistry as a viable profession.

This sentimental journey allowed me to appreciate CDA's rich history of service to the profession. Dentistry in Canada has benefited from these years of service, and in return we must support our Association so this great work can continue.

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Alfred Dean, DDS  
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# Letters

## Editor's Comment

The *Journal* welcomes letters from readers about topics that are relevant to the dental profession. The views expressed are those of the author and do not necessarily reflect the opinions or official policies of the Canadian Dental Association. Letters should ideally be no longer than 300 words. If what you want to say can't fit into 300 words, please consider writing a piece for our Debate section.

## HealOzone

I am writing with respect to the *CDAlert* sent out last June regarding the new HealOzone technology, which is made by Kavo and is available from SciCan in Canada at a cost of over \$25,000.

I believe that it is premature to put this technology on the market primarily on the basis of numerous published abstracts written largely by Professor Ed Lynch, of Belfast, and his colleagues. The only published clinical caries trials of the effects of ozone in reversing root-surface caries appear to be those of Baysan and Lynch<sup>1</sup> and Holmes.<sup>2</sup> The former trial had no control group in which the root-surface lesions were not exposed to ozone, while the latter was a small trial carried out in the author's private practice.

The *CDAlert* stated that "the theory behind HealOzone is solid." This statement might lead dental practitioners to believe that the anticariogenic effects of ozone have been established. For treatment of an early caries lesion, the surface of the lesion is exposed to ozone for 10–40 seconds and the excess ozone is sucked away. Ozone is a very powerful oxidizing agent and can be expected to have deleterious effects on the microorganisms in dental plaque, particularly the anaerobic ones. The ozone would therefore be expected to kill all or

most of the microorganisms in the plaque, or at least the surface plaque, and there is some good evidence that this occurs.<sup>1</sup> However, ozone has no substantivity and I can see no reason why the surface of the caries lesion would not rapidly be recolonized by microorganisms from other sites in the mouth. Recolonization of the lesion surface by strongly acidogenic microorganisms could be delayed, but that may not necessarily retard the rate of caries progression. Canadian dentists will remember that a few years ago we received many inducements to apply chlorhexidine varnish to the teeth of our caries-active patients, on the basis that the varnish had been shown to reduce for many weeks or months the number of *Streptococcus mutans* in the mouth. In a subsequent large clinical trial,<sup>3</sup> the effects of the varnish on oral *S. mutans* numbers in the mouth were confirmed, but the varnish did not reduce the caries incidence.

The word "heal" in "HealOzone" implies that the treatment with ozone alone would promote remineralization of a treated lesion. However, there seems to be no theoretical basis upon which ozone can be expected to promote remineralization, which depends on such factors as the presence of an intact tooth surface zone, maintenance of a clean tooth surface, and access of calcium, phosphate and fluoride ions from saliva supersaturated with respect to tooth mineral. Thus I could imagine that after ozone treatment, the progress of a caries lesion could be delayed for a short time, but it is not obvious why the lesion would not then progress at the same rate as previously.

Very recently, all the publications on ozone therapy for the treatment of dental caries were subjected to a Cochrane review.<sup>4</sup> The authors of that review concluded that "there is a

fundamental need for more evidence of appropriate rigour and quality before the use of ozone can be accepted into mainstream primary dental care."

In conclusion, I think that before purchasing the HealOzone equipment, Canadian dentists would be wise to await the publication of some large, independent clinical trials in which any anticariogenic or remineralizing effects of ozone are shown conclusively.

Dr. Colin Dawes  
Winnipeg, Manitoba

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## Response

Thank you for the opportunity to reply to Dr. Dawes' letter on HealOzone. The rationale and evidence for this technology can be found in *Ozone: The Revolution in Dentistry*.<sup>1</sup> The chapter on evidence-based research documents almost 100 published reports proving the successful use of HealOzone.

Baysan's PhD thesis<sup>2</sup> on the reversal of root caries using ozone not only had a proper control group, but it also conclusively proved the clinical reversal of root caries using HealOzone. It is notable that the International Association for Dental Research awarded Dr. Baysan a prize for her work, including the methodology used in her PhD thesis.

I am surprised at Dr. Dawes' impli-

cation that there might be something inferior associated with dentists carrying out clinical research in their own general practices. Many researchers would argue that randomized, double-blind, prospective clinical trials such as the study by Holmes<sup>3</sup> are preferable as they are carried out in the “real world.” Dr. Holmes was honoured in 2004 by the International Association for Dental Research for this clinical trial, which also proved the clinical reversal of root caries using HealOzone.

Professor Hickel and some of his team have published results of their clinical research with HealOzone, proving the reversal of occlusal pit and fissure caries within one month.<sup>4</sup> This concurs with the recommended method for treating these lesions, which is to treat pit and fissure caries with HealOzone at the first visit and to repeat the ozone treatment after one month, before sealing these lesions.

Professor Adrian Lussi from the University of Berne in Switzerland has published the results of his successful treatment of deciduous caries in phobic children using HealOzone.<sup>5</sup>

The PhD thesis<sup>6</sup> of Dr. Layla Abu-Naba'a conclusively proves the reversal of pit and fissure caries after one month, again supporting the sealing of these lesions one month after HealOzone treatment. It is also notable that Dr. Abu-Naba'a was awarded the Basil Bibby Cariology award in 2002 from the International Association for Dental Research.

I agree entirely with Professor Dawes that HealOzone can kill most microorganisms. Professor Lars Petersson has supervised research in Sweden proving the efficacy of HealOzone in killing microorganisms.<sup>7</sup> The Baysan and Lynch<sup>8</sup> paper provides evidence as to how this killing is associated with clinical reversal of lesions and the dramatic clinical reduction in microorganisms even after more than 5 months. The Quintessence book<sup>1</sup> clearly documents why substantivity is not

required with ozone. My PhD research<sup>9</sup> reported that lactobacilli are the most important microorganisms associated with caries in dentin. Chlorhexidine is not clinically effective against these microorganisms. HealOzone kills lactobacilli almost on immediate contact.

The Cochrane review<sup>10</sup> ignored the numerous clinical trials proving the reversal (healing) of caries using HealOzone for up to 6 months. This is unfortunate considering that the recommended treatment method is to seal the lesions after one month. Outcome measures, as used in dentifrice studies, cannot be applied to lesions professionally treated with ozone and sealed within one month. Cochrane also did not consider other evidenced-based studies such as the one by Holmes.<sup>3</sup>

Thousands of dentists are using HealOzone in their daily practice and many have stated that they are very pleased to be able to care for their patients preventively and conservatively without the need for injections, drilling and conventional filling. HealOzone fits with 21st century concepts of prevention, where patients are identified based on their caries risk and advised to limit their frequency of consumption of fermentable carbohydrates and to increase the frequency of exposure to fluoride.

*Professor Edward Lynch  
Specialist in endodontics, prosthodontics  
and restorative dentistry*

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#### Oral Conditions Associated with Quid-Chewing Habits

I read with interest the article on oral mucosal lesions associated with the use of quid<sup>1</sup> and wish to add a few points that may be of interest to dentists.

The ingredients used in betel quid are usually in raw or unprocessed form. However, processed substances are slowly replacing conventional betel quid. Processed products like gutkha or pan masala are more carcinogenic and genotoxic.<sup>2</sup> In one study,<sup>3</sup> symptoms of oral submucous fibrosis began to appear 2–3 years after patients started consuming pan masala and gutkha, compared with 20–25 years for patients who chewed only betel quid. Chewing betel quid has a chronic carcinogenic effect; pan masala has an acute carcinogenic effect. Onset of symptoms in patients can therefore be predicted on the basis of the history of their habit.

Betel leaf extract contains ingredients like betacarotene and aliphatic polyphenols, which possess antimutagenic properties against standard mutagens and tobacco-specific nitrosamines.<sup>4,5</sup> Betel leaf extract in combination with turmeric also has anticarcinogenic and chemopreventive properties.<sup>5</sup> Therefore, chewing betel quid is less harmful than consuming gutkha and pan masala. In view of the increasing incidence of oral cancer, the use of processed tobacco forms should be discouraged.

*Dr. Ajit Auluck  
Manipal, India*

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**What’s the Diagnosis?**

As I finished reading a case presentation on Class V restorations written by a well-respected clinician in the area of direct composites, it struck me that the article did not dedicate even one line to diagnosis. There was no explanation as to why this patient needed 10 Class V restorations in one arch.

Perhaps this article was an anomaly. Surely most technique articles, case presentations or papers advocating a particular product or technology dedicated at least a few lines to diagnosis. Or so I thought.

Over the next month I scrutinized articles from various clinical journals, yet was often disappointed to discover that the question of *why* treatment was undertaken was vastly overshadowed by *how* treatment should be performed. Whether the subject was periodontics, endodontics or surgery, diagnosis was not discussed. Take, for example, a hypothetical article on the esthetic and functional management of fixed prostheses in the maxillary anterior dentition. It would be valuable to the reader to know why the patient presented with mild-to-moderate crowding, a deep overbite and several chipped and fractured teeth. Obviously, I am referring to the fact that the underlying problem is orthodontic in nature and that reten-

tion after prosthetic treatment should be considered.

There are peer-reviewed journals such as our own *JCDA* that demand comprehensive submissions. However, the fact is that general practitioners are besieged by product-inspired literature. It is my feeling that repeated exposure to articles that teach clinical excellence while neglecting diagnostic inquiry will have an insidious effect, in that we may be encouraged to perform the wrong treatment really well.

My submission to all my respected colleagues in this wonderful profession of ours is that we should strive to be not only highly skilled “doers” but also excellent “inquirers.”

*Dr. Ali Farahani  
Yellowknife, Northwest Territories*

**Rogue Dental Supply Company**

I read with interest the news item about the rogue dental supply company in the October issue of *JCDA*.<sup>1</sup> Unfortunately, some companies believe that dentists aren’t very savvy business people and they exploit this belief when they market products and services to the profession. On occasion, the promises made by the individuals representing these rogue companies do not materialize. I conducted an informal study of Canadian dentists and found that when they make business decisions, dentists rely significantly on the trust factor. I believe that this trust is often not based on actual proof.

A similar situation has arisen in the dental equipment leasing industry. I have been made aware of numerous situations where dentists obviously do not understand the leases they have signed, nor do they have any idea as to the actual, effective annual interest rate they are paying. I believe this situation exists partly because leasing companies are not regulated like chartered banks. Their documents usually contain very limited information with

respect to interest rates, if any at all. While this is legal, it often causes confusion and can result in misinformation. I suspect that many dentists have found their leases difficult to understand and that very few raise the matter with their leasing company, because they may be embarrassed to admit their mistakes. Many dentists have admitted this to me.

I write this letter only to bring this serious matter to the attention of your readers. My advice is to carefully examine lease documents for new dental equipment acquisitions and to have them independently reviewed by a third party before signing them.

*Timothy A. Brown  
President and CEO  
ROI Corporation*

**Reference**

1. Rogue dental supply company declares bankruptcy [News]. *J Can Dent Assoc* 2004; 70(9):592.

**DIAC’s 9th Annual Future of Dentistry Survey in Next *JCDA***

*JCDA* will carry the Dental Industry Association of Canada’s (DIAC) 9th Annual Future of Dentistry Questionnaire in the February 2005 edition.

Your input is valuable in assisting DIAC’s members to continue to develop products and services to satisfy the fast-paced, market-driven, technologically challenging world of today.

For more information, contact Eric Jones, president, Eric P. Jones & Associates Inc., 90 Welland Avenue, St. Catharines, ON L2R 2N1; tel.: (905) 684-2771; fax: (905) 684-4601; e-mail: ejones@vaxxine.com.

## Loss of Income Due to Flu Pandemics Not Insured

With governments treating the possibility of a serious influenza pandemic (a country wide or world-wide outbreak of a severe “flu”) as very real, dentists may wonder how their practices would be affected by such an event. Although the details of what might happen can only be speculated on, dentists should be aware that their office insurance will not cover lost income should their patient numbers be affected.

If an influenza pandemic occurred, patients might not make new appointments (or keep existing ones) for fear of coming in contact with infected people. Also, a dentist might potentially choose to temporarily close his or her practice for a similar reason. Practice interruption insurance, however, does not cover such situations, since it is chiefly meant to replace lost income in instances when the practice must be closed for reasons such as fire, vandalism or

other insured peril (or repairs after damage from an insured peril).

What if a government authority forces the closure of a practice, as a measure to try to keep disease from spreading? Practice interruption insurance covers “lack of access” when you are prohibited from entering the premises by the order of a government authority, if you are evacuated as a result of a sudden, accidental event — but only when the order is a direct result of damage to neighbouring premises by a peril insured against under the policy. For example, if you were evacuated because there was a fire in a building adjacent to your practice, your coverage might apply.

However, since government closure of a practice for disease control reasons would not be considered an evacuation as a direct result of such a sudden, accidental event, practice interruption insurance would not apply under this situation. To the best of our knowledge, getting

coverage in Canada to cover such an event is not currently possible, so lost income due to a flu pandemic will not be covered, independent of where you hold your office insurance policy. ♦

## CIHI Forecasts Canada's 2004 Dental Service Expenditures

The Canadian Institute for Health Information (CIHI) released forecasts for Canada's 2004 health expenditures in its *National Health Expenditure Trends (1975–2004)* report.

Published in December, the CIHI numbers indicate that the private sector accounts for the overwhelming majority of total expenditures on dental services in Canada.

The total amount spent on dental services in Canada is forecast at \$9.28 billion in 2004, with only \$424.3 million being public sector expenditures. A downward trend is noticeable as the proportion of total dental expenditures from the public sector decreased by a percentage point to sit at 5% in 2004.

Other significant numbers included the total health care expenditures in Canada (from both the public and private sector) forecast at \$130.3 billion for 2004. This continues an upward trend from \$114.0 billion in 2002 and \$123.0 billion in 2003. According to the CIHI forecasts, expenditures on dental services will account for 7.1% of this \$130.3 billion total. The total amount spent on dental services increased in 2004 by 5.5% from the 2003 figure.

CIHI's 8th annual report provides an overview of national health care spending from 1975 to 2002, as well as forecasts for 2003 and 2004. These recent forecasts are based on health expenditure figures found in the various provincial and territorial government budgets and spending

## COVER ARTIST

The cover art for this issue is an oil painting by Dr. Walter Vogl of Toronto. “The Jamaica scene has several elements of contrast and a certain mystery that appealed to me,” explained Dr. Vogl.

Dr. Vogl first tried his hand at painting at the age of 14. He was attracted to his preferred medium of oils by his father. “My dad did several oil paintings, mostly landscapes in and around Sault Ste. Marie...

I remember being drawn not only to the paintings themselves, but the vivid colours and texture as well as the smell of the linseed oil.”

The 1978 graduate of the University of Toronto learned more about the craft of oils after completing his residency at Mount Sinai Hospital. Dr. Vogl was able to paint almost every week and enjoyed artistic inspiration each time he picked up a brush. However, he told *JCDA* about a creation of an entirely different ilk which may delay his future artistic output. “We have an 8-month-old son now, so my brushes will be dry for a while.” ♦



trends in the private and other public sectors. ♦

### Dental Consultation Statistics

More oral health information from the 2003 Canadian Community Health Survey (CCHS) conducted by Statistics Canada has been analyzed and published (*Health Reports*, 16(1):41-4). CDA first reported on preliminary findings of this survey in the July/August editions of *JCDA* (p. 442-3) and *Communiqué* (p. 9).

One of the main oral health questions asked in the survey was, "In the past 12 months, how many times have you seen, or talked on the telephone, about your physical, emotional or mental health with a dentist or orthodontist?"

Analysis shows that education and household income were 2 factors associated with dental consultations. In terms of education, 70% of those with a college or university degree reported at least one annual visit, compared to 47% of those with less than high school graduation. In terms of household income levels, 77% of those in the highest income households reported a visit, as opposed to just 44% in the lowest income bracket.

Comparing information from a similar survey conducted by Statistics Canada in 1978, there were significant increases in consultation rates in the "high income" households. The gap between this population group and the "low income" households expanded from 23% in 1978 to 34% in 2003.

In addition to household income levels, possessing dental insurance was also an important factor in determining whether someone had visited a dentist in the previous 12 months. Seventy-four per cent of those who had insurance to cover all or part of their dental expenses consulted a dentist, contrasted with 48% of those without insurance.

The CCHS also asked participants to report on the reasons why they had not visited a dentist in the past

3 years. Again, household income and insurance status were factors in the answers provided. Of those who gave

"cost" as a reason for not visiting, 22% were from the low income group compared to 9% from the high

### CDA Hosts Annual Academic Event

CDA organized another successful Academic Event, held this year in Ottawa on November 27 and 28. This year's meeting was the third in a series aimed at addressing many of the significant issues facing academic dentistry in Canada.

This year's meetings included discussions on the evaluation and licensing of specialists from non-accredited programs, determining whether the needs of dental academia are aligned with the profession, and examining the licensing policies for international dentists seeking eligibility to teach in Canadian faculties of dentistry.

Special guest speakers included Dr. Ian Bowmer, from Health Canada's Human Health Resources Strategies Division, Dr. Gordon Thompson, chair of the Canadian Dental Regulatory Authorities Federation, and Dr. Johann de Vries, chair of the Association of Canadian Faculties of Dentistry Deans' Committee.

The 2004 Academic Event was structured to receive substantial input from meeting participants, as evident in the many small group discussions and the plenary session which took place on the first day. The second day was devoted to setting priorities and developing a preliminary plan of action.

Among the conference invitees were the deans and admissions officers of the 10 faculties of dentistry, representatives of CDA (including a representative of the specialties), the Commission on Dental Accreditation of Canada, dental regulatory authorities, the certifying bodies, the dental industry, and the American Dental Association (ADA). CDA was pleased that Dr. Bob Brandjord, ADA president-elect, was able to attend this year's meetings.

CDA would like to thank Procter & Gamble (makers of Crest), Nobel Biocare, Septodont, Philips Sonicare and Cadbury Adams (makers of Trident Gum) for their generous contributions to the annual Academic Event. ♦



L. to r.: Dr. Johann de Vries, chair of the Deans' Committee of the Association of Canadian Faculties of Dentistry, with Dr. Ian McConnachie, vice-president of the Ontario Dental Association.



L. to r.: Dr. Bob Brandjord, president-elect of the American Dental Association, with Dr. Alfred Dean, CDA president.

income group. As well, while only 7% of those with insurance chose cost as a reason for not seeing a dentist, almost 1 in 4 (26%) of the non-insured group pointed to cost as a determining factor.

Other answers given for not visiting the dentist in the past 3 years were “not necessary” (31%), “wear dentures” (27%), “not gotten around to it” (10%), and “pain or embarrassment” (5%).

Residents of rural areas were less likely than those in urban areas to have consulted a dentist in the past year.

A higher percentage of women than men had seen a dentist in 2003 — 66% versus 61%.

The rate of dental consultation declined with age as those aged 25 to 54 visited 60% of the time while those classified as seniors visited 46% of the time.

The CCHS is a general health survey that included information on household populations aged 12 or over. Significantly, the survey did not include residents of Indian reserves and those who live in some of the more remote rural areas in Canada. These are precisely the population groups who need access to adequate oral health care and for whom detailed statistical information is required. This is one of the reasons CDA is pressing the federal government to appoint a Chief Dental Officer, who could spearhead the collection of truly national oral health statistics. ♦

**Annual CDAC Meeting Held in Ottawa**

The 2004 annual meeting of the Commission on Dental Accreditation of Canada (CDAC) was held over 3 days from November 13–15 in Ottawa.

In consultation with its stakeholders, CDAC develops and approves accreditation requirements for dental, dental specialty, dental internship/residency, dental hygiene and dental assisting educational programs, as well as hospital dental facilities. CDAC

grants accreditation status to those educational programs and health facilities meeting the Commission’s accreditation requirements.

If you are interested to learn more about CDAC’s accreditation requirements for educational programs and health facilities, visit CDAC at: [http://www.cda-adc.ca/english/dentistry\\_in\\_canada/cdac/default.asp](http://www.cda-adc.ca/english/dentistry_in_canada/cdac/default.asp). Highlights of the 2004 annual CDAC meeting will be posted on the Web site.

The chair of CDAC is Dr. Claude Lamarche, dean of the University of Montreal’s faculty of dentistry and representative of the Deans’ Committee of the Association of Canadian Faculties of Dentistry on CDAC. At the 2004 meeting, CDAC members re-appointed Dr. Lamarche to serve for a second term as chair. ♦

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For direct access to the Web sites mentioned in the News section, go to the January *JCDA* bookmarks at <http://www.cda-adc.ca/jcda/vol-71/issue-1/index.html>.

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# Thank You... A Salute to Our Reviewers

The peer review process is the cornerstone of our *JCDA*. It ensures that the material presented in the publication meets certain criteria of quality, accuracy and relevance to practice. In my opinion, the reviewers listed below are the unsung heroes of the *Journal*. They are all very busy professionals, yet they cheerfully provide me with high-quality advice with regard to the manuscripts they evaluate. They give their valuable time and expertise without monetary compensation. I extend to them, on behalf of the Canadian dental profession, a profoundly felt thank you.

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If I have failed to recognize publicly the efforts of anyone I have approached to review manuscripts in the past year, I apologize. I am always on the lookout for more help with reviewing manuscripts. If you would like to contribute to the profession by reviewing English or French submissions, please don't hesitate to contact me.

*Dr. John O'Keefe, Editor-in-Chief*



# Access and Care: Towards a National Oral Health Strategy — Report of the Symposium

• Ruth R. Armstrong, MBA •

© J Can Dent Assoc 2005; 71(1):19–22

The impetus for this symposium, which was held May 13–15, 2004, arose from growing awareness among Ontario-based social service agencies and dental and dental hygiene teachers that oral health is becoming less and less important in the eyes of many health care services policy-makers. Specifically the planners of the symposium could point to the following:

- oral health and oral health care were excluded from consideration in the *Future of Health Care in Canada* (the Romanow report)
- unlike most developed countries, Canada has no recent information on the oral health status of its citizens obtained from a nation-wide survey
- there is virtually no planning for future dental provider roles or requirements
- Canada has no national dental care program for children and expectant or new mothers (such programs are available even in many developing countries)
- in Toronto, hospital-based dental clinics have been closed, resulting in a severe impact on training of future providers and services to clients who normally use these clinics
- public programs for seniors and children have been reduced or cancelled
- fees for training in dentistry are higher and, consequently, student debt is higher
- there are extreme limits on dental coverage for those on welfare and, in most provinces, almost nothing for the working poor and seniors
- Canada has income-tax-free care for those with employer-paid dental insurance
- most importantly, no one has accepted the challenge of improving the situation.

The symposium was hosted by the University of Toronto's faculty of dentistry, George Brown College (Dental Hygiene Program) and the Toronto Oral Health

Coalition and supported by A-dec, the Canadian Association of Public Health Dentistry, the Canadian Dental Hygienists' Association, George Brown College, Health Canada, the Ontario Association of Public Health Dentistry and an anonymous donor.

Participants from a wide variety of stakeholder groups were invited to help develop recommendations to improve oral health in Canada. Invitations were extended via electronic bulletin boards of dental public health and dental hygiene organizations in Canada; mailed to potential funders, such as national professional dental organizations, dental insurance carriers and dental manufacturers and their agents; posted on the faculty of dentistry's continuing education Web site; and distributed with the survey of social and health service and regulatory agencies (see Patricia Main below).

In all, 141 people (including facilitators for the working groups attended one or more of the sessions. Participants included:

- dental professionals (dentists, dental hygienists, dental therapists, denturists, dental technologists and technicians) and representatives of the dental professional bodies
- academics
- students in dental hygiene, dentistry, dental public health and PhD programs
- community organizations promoting oral health and serving people with limited access to oral health (e.g., seniors' organizations, long-term care facilities, community health centres, district health councils, public health associations, mental health workers)
- government organizations (both elected politicians and civil servants)
- consumers with low income.

Although participants came mainly from Ontario, they also included people from across Canada and beyond (Australia). The symposium was designed to produce an

Dr. David Mock, dean of the University of Toronto's faculty of dentistry, and Dr. Carolyn Bennett, minister of state (public health).

Dr. Steven Patterson, chair of the Federal, Provincial and Territorial Dental Directors, provided an overview of the Canadian Oral Health Strategy.



Symposium participants Dr. Patricia Abbey, director of dental health, Durham Region Health Department, and Dr. Aaron Burry, director of community services, City of Ottawa.

In her summary report, Ruth Armstrong noted the strong concurrence of the symposium participants on the need for data collection to describe the oral health status of Canadians.

Dr. James Leake, professor and head of community dentistry at the University of Toronto, discusses oral health care delivery systems in Canada with symposium participants.

outline of potential policy areas based on a summary of current policies in Canada and evidence of how other jurisdictions are dealing with oral health issues. Participants heard presentations on a variety of topics, then, on the second day, broke into working groups to provide their advice on what needed to be done.

The keynote speaker was Dr. Dushanka Kleinman, chief dental officer and assistant surgeon general, United States Public Health Service, and deputy director, National Institutes of Dental and Craniofacial Research, whose topic was *Placing oral health on the health care agenda: lessons learned from the United States*.

Other topics and speakers included:

- *Why do Canadians need an oral health care strategy?*  
James Leake, faculty of dentistry, University of Toronto
- *Financing and delivering oral health care: what can we learn from other jurisdictions?*

Stephen Birch, Centre for Health Economics and Policy Analysis, McMaster University

- *Perceptions of dental care delivery: survey findings, May 2004*  
Patricia Main, faculty of dentistry, University of Toronto

Following these were shorter presentations on oral health care needs and innovative research and programming from the perspectives of the faculties and hospitals (David Mock); the Nova Scotia Seniors' Oral Health Project (Valerie White); the Victoria Clinic (Bruce Wallace); the Federal, Provincial and Territorial Dental Directors (Steven Patterson); the project Determining Family Dental Health (Jonathan Lomotey); an oral health program for a First Nations community (Sherry Saunderson); and a hotel and restaurant employees clinic (Eva Iperifanou).

In advance of the meeting, the planning group established 6 potential topic areas for group discussion; one

other was suggested at the symposium. Participants then “signed-up” to discuss one of the following:

1. public awareness and attitudes
2. training, development and regulation
3. publicly financed models for dental health service delivery
4. privately financed models for dental health service delivery
5. knowledge transfer and evidence-based care
6. marginalized populations
7. dental education's role as a service provider.

Each working group was to focus and report on:

- identifying possible directions to be taken
- recommending major strategies to achieve the directions
- defining the roles to be played by various stakeholders
- identifying the next steps that could or should be taken.

The next morning began with a passionate presentation on the need for improvements in the national public health infrastructure by the Honourable Carolyn Bennett, minister of state (public health). Minister Bennett promised that oral health would have a place in the new federal public health agency and she would expect the new chief medical officer of health to place oral health on the agency's agenda.

The output from each of the working groups was transcribed overnight and copies were available the next morning for presentation. During discussion of the output reports, 2 additional priorities surfaced and were unanimously accepted: the need for an infrastructure to support the ongoing work in oral health policy; and the advisability of another symposium in 2 years.

In the plenary session, 3 additional strategies surfaced. Participants ranked the importance of the 7 themes listed above and the 3 additional strategies as their choices for action (**Box 1**).

The results were clear. The symposium participants identified 4 priority actions:

- collect data on the oral health status of Canadians
- improve public awareness and attitudes toward oral health
- address the needs of marginalized populations
- advocate the establishment of a national chief oral health officer.

Dr. David Mock, dean of the faculty of dentistry, University of Toronto, offered to house an interim committee that would take the next steps. Dr. Jim Leake and Ms. Lorraine Purdon from the original planning committee agreed to head up the interim committee and invited others to join them. The committee is to ensure that there would be an infrastructure to implement the priority steps and organize the next conference in 2006. Participants agreed that organizing a conference in 2 years

### **Box 1 Ranking of the themes and additional strategies as priorities for action**

1. Public awareness and attitudes	26 votes
2. Training, development and regulation	4 votes
3. Publicly financed models	12 votes
4. Privately financed models	0 votes
5. Knowledge transfer and evidence-based care	3 votes
6. Marginalized populations	25 votes
7. Dental education's role as a service provider	4 votes
8. Development of a collective vision	3 votes
9. Advocacy to acquire a national chief oral health officer	24 votes
10. Data collection on Canadians, i.e., a national survey	51 votes

would provide a focus for implementing the next steps and a vehicle for accountability.

Participants indicated their interest in working on the committee and the priorities by submitting their interests and e-mail addresses.

### **Some Observations**

The symposium's results reflect the rationale for its development and the influence of the 3 host agencies, while also incorporating input from many different stakeholders across Canada. Although one might argue that the participants did not fully represent the broad range of stakeholders, this symposium did “get the ball rolling” in attracting various communities of interest. Diverse points of view found expression during the plenary sessions, through questions and comments, as well as in the working groups. Overall, people were respectful when listening to or expressing points of views, thereby creating an open forum for the exchange of ideas.

The symposium offered a balance of scientific, objective presentations and more qualitative community-based experiences. Combining scientific reporting with telling the compelling story of local examples appeared to strengthen the messages received by the participants and led them to identify an essential set of 4 priorities and the need for a future conference in 2006. This effective 2-pronged technique should improve the outcomes as they are reported to and received by a variety of audiences.

The concurrence on the need for data and evidence-based information as the foundation on which to build oral health policy was impressive. There was overwhelming support for pursuing the data collection necessary to describe the oral health status of Canadians.

Leadership will be critical in providing infrastructure and moving forward. Progress should be enhanced by the apparent willingness of a critical mass of individuals to participate in implementation. Many people responded to the “call for action” in contributing to the next steps. Participants expressed a strong demand for leadership from Health Canada in appointing a chief oral health officer.

For the 2006 symposium, planners should continue to invite diverse communities of interest; to gather, share and discuss scientific data; and to include presentations from informed speakers and about innovative programs. The symposium should build on the feedback from the 2004 symposium evaluations; the priorities and strategies identified; and the efforts of other groups, organizations and communities. The next symposium should be held in another city in Canada and explore other outreach strategies to attract stakeholders who were absent from this one. ♦

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*Ms. Armstrong was the facilitator of the Access and Care symposium. She is president of VISION Management Services.*

*The views expressed are those of the author and do not necessarily reflect the opinions or official policies of the Canadian Dental Association.*

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Ms. Armstrong’s summary report, as well as the presentations listed in her article, are available on the Access and Care symposium Web site at <http://individual.utoronto.ca/accessandcare/>. The keynote presentation by Dr. Dushanka Kleinman was reprinted in the December edition of *JCDA* (p. 751–4). Dr. Kleinman’s presentation is also available online.

*JCDA* is grateful to Susan Deshmukh for permission to reprint the photos.

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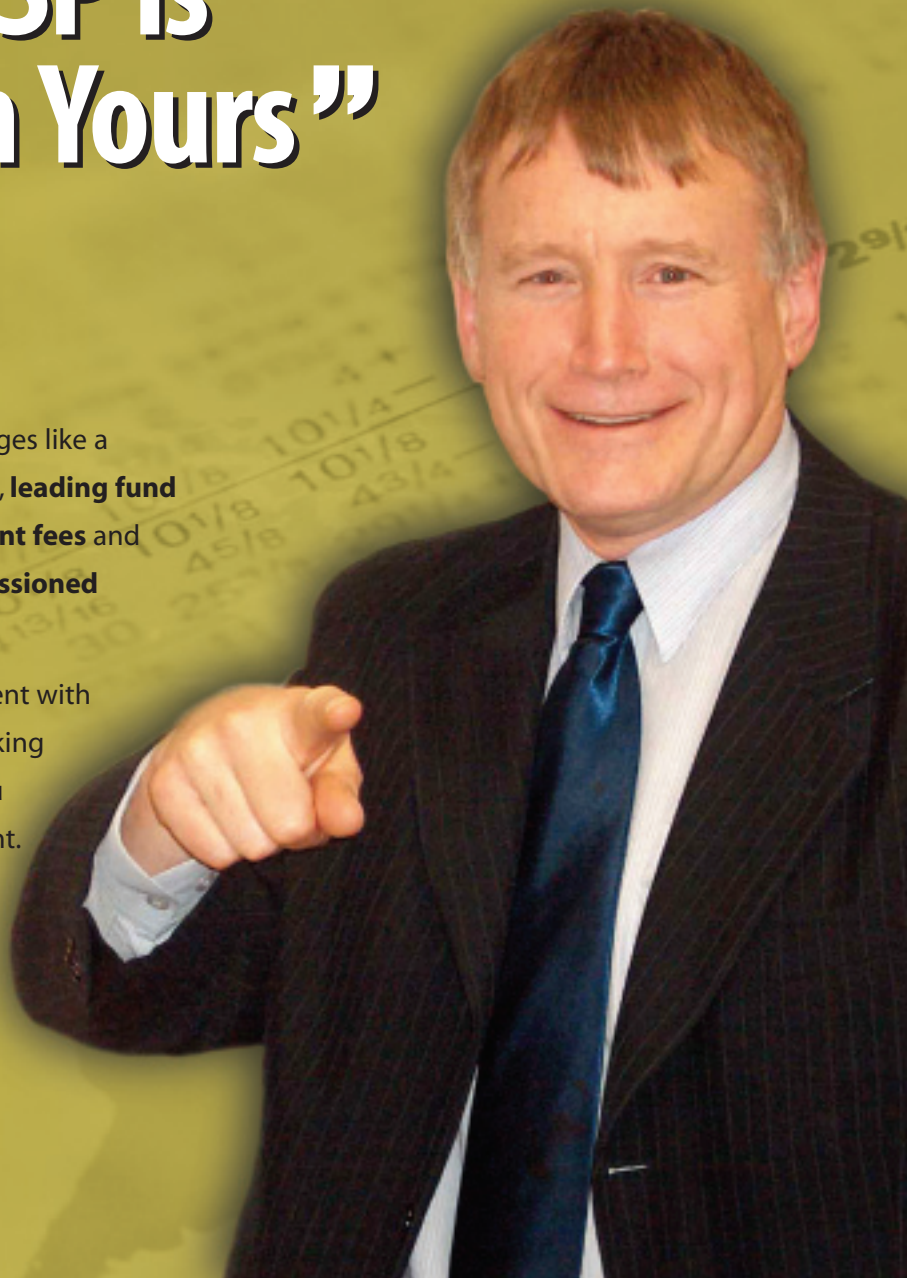
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# A Professional Psychologist and Dental Phobic Speaks...

• John Harvey, MA, MDiv, LPsych •

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Is there a pragmatic approach to handling the dread that goes with dental care for many people? As a clinical psychologist, I recognize the difficulties of working with people who have anxiety disorders. And I bring some of my worst, most irrational fears to my own dentist's office. I no longer vomit from apprehension before a visit to a dentist's office, but I've had to work very hard to handle this fear. This is what has helped me.

I am a middle-aged man who had his first dental examination in 1960. The experience was appalling from a mental health point of view. The sensory experience was overwhelming and included the pain of having several fillings and new, inexplicable, unique and powerful smells, tastes and sounds. The dentist had on magnifying glasses that kept me from seeing his eyes. I cannot remember him addressing me directly except to tell me to be quiet. From a classical conditioning point of view, it was a total bust. Virtually every sensation I experienced was associated with intense fear from my first visit onward.

What psychologists call "stress inoculation" would have been enormously helpful. If I had been introduced to the setting and some explanation had been given, it would have made at least some difference to me. It is wonderful that my children have been treated with intelligence and respect in this context. Although neither of them loves a dental procedure or checkup, the stress on them and their practitioner is, thus far, very small.

When I first went to see the dentist as a little boy, my dentist demanded that I stop crying (I was 4) or he would send my mother out of the room. Many years later, in graduate school I remember being in analysis and my therapist helping me to understand that some of my fear was an association with parental abandonment and dentistry. Fears generalize and grow if not correctly addressed. By the time I did begin to address this fear, it had grown into an association between dentistry and death. I mention this simply because there is a cognitive — notice that I did not say rational — element to these fears. What causes children considerable distress in life need not make sense to adults.

An unpleasant day in a child's life can grow into an affliction that can cripple an adult.

I have learned a trick I am reluctant to dignify with the term "cognitive restructuring" that helps me with the above problem. I purposefully now think of going to the dentist as something good that I am doing for myself or giving to myself. This has helped immeasurably. I can handle the apprehension better if I think of the purpose of my trip as being for my own good rather than as a catastrophic (to a 4-year-old) situation that puts me beyond the aid of a parent.

I now go to a dentist whose office is in an old house. Of course I don't go to this dentist because she practises in a house, but I mention it anyway. It only occurred to me many years later that I find her workplace quite reassuring. It's not that I don't realize where I am or what is going on, but the place looks so "normal." Don't laugh. The associations are far more comforting in this creaky old place than in a polished suite where the rooms are purpose-built to house the tools of the trade. It's a small, but not inconsequential thing.

Remember that the 2 dimensions of stress are always high demand plus actual and perceived level of control. More than anything else, people consulting me as a psychologist mention loss of control as a factor in their stress-related illnesses and distress. Most of them can handle even high demands, as long as they can distinguish them from impossible demands. But take away control and the anxiety level skyrockets. In the dentist's chair, allowing patients to use a pre-arranged hand signal when they want their dentist to stop or administer more anesthetic or when they need to speak or spit or take a momentary break is fundamental to the control of stress from the patients' point of view. In fact, it makes the treatment a collaborative experience.

Linked to this are the dentist's and her staff's appearance and mannerisms. I know that this is obvious, but now when I go the dentist, they give me the morning paper while they fire up the x-ray machine or examine my daughter's teeth. The radio is playing some CBC thing. The talk is about the weather or some news item. The dentist is so confident and



easy-going that I can do the cognitive restructuring or relaxation work I need to do without wondering what they are thinking or feeling or what is distressing them.

These small changes in the experience of getting dental care have helped those with dental fears a great deal. For me and for many dental phobics, the anticipatory anxiety is the worst. Once the visit starts, I can often feel the tension begin to drain away. And I firmly believe that the best anxiolytic is good information. I like to be told what is going on in my mouth and I like to be asked my opinion. Humour me. I may be just a layperson but it's my mouth even if the clinical and therapeutic picture is clear.

I find that deep-breathing exercises and "self-hypnosis" types of relaxation exercises can and do work. The trouble with them is that they usually work only if you practise them pretty much daily. Add to this the possibility of hyperventilating if the breathing exercises are done incorrectly and the practicality of this approach seems limited. I won't say don't try meditating in the examining room, but it may not be the best place to start practising. The exception to this would be a course of relaxation training that was actually undertaken in a dental suite under the direction of a behaviour therapist probably when no examination, cleaning or intervention was scheduled. That said, systematic desensitization with "imagined" stimuli (memories of trips to the dentist) never really helped me. It has been informative, kind and competent dentists who have helped me re-learn (literally) how to be a dental patient — through repeated exposure to good, collaborative care. Remember. If you learn fears, you can unlearn them or learn new behaviours that replace the old, disruptive ones.

This brings me, last of all, to medications and self-medication. Dental phobics think they're the only ones who have these types of problems. Fear always isolates. I remember confessing my fear of dentists to a colleague once when I was in my thirties. Nonplussed he looked straight at me and said, "I drink before I go."

The problem is that from a learning theory point of view, people aren't in dentists' chairs long enough to allow their fears to extinguish. And avoidance just makes the anxiety worse. So maybe for some isolated procedures and

for some particular patients who have very high levels of anxiety, an anxiolytic medication may be helpful. Obviously the risk of addiction and present and future abuse has to be weighed carefully. I tend to think that with anxiety in particular (as opposed to other mood disorders) medication is a last resort.

I know that dentists can have a difficult job. The profession seems to have come a very long way since 1960. I'm very glad it's made the effort. ♦

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*The views expressed are those of the author and do not necessarily reflect the opinions or official policies of the Canadian Dental Association.*

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# Prevalence of Caries among Preschool-Aged Children in a Northern Manitoba Community

- Robert J. Schroth, DMD, MSc •
- Pamela J. Smith, PhD •
- Jeanne C. Whalen, MSc •
- Charles Lekic, DDS, PhD •
- Michael E.K. Moffatt, MD, MSc, FRCPC •

## A b r i d g e d V e r s i o n

The complete article can be viewed on the *eJCDA* Web site at: <http://www.cda-adc.ca/jcda/vol-71/issue-1/27.html>

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This article has been peer reviewed.

**E**arly childhood caries (ECC) is a devastating form of dental decay affecting many Canadian children, especially those from northern First Nations communities. A current definition of ECC is the presence of at least 1 primary tooth affected by caries in children under 6 years of age. ECC is multifactorial in origin and the notion that the principle etiology is inappropriate feeding modalities is no longer tenable. Nutritional stress during prenatal development may affect the integrity of the developing primary tooth enamel, thus limiting the ability of the tooth to resist bacterial invasion and caries attack, as enamel hypoplasia is an identified risk factor for caries.

**Methods:** This study was conducted in the community of Garden Hill First Nation, Manitoba, to assess the prevalence of dental decay in young children, to assess risk factors for ECC and to determine the influence of vitamin D supplementation (a modified form of stosstherapy using 100,000 IU vitamin D), both prenatally and at 6 weeks of age on the oral health of children. Modified stosstherapy was introduced as a rickets prevention strategy in this community. The study was approved by the Health Research Ethics Board, University of Manitoba, and the Band Council of Garden Hill First Nation. Participation in this cross-sectional and retrospective study involved a dental examination of children, an interview with mothers and a maternal chart review to determine supplementation status.

**Results:** A total of 98 children participated; their mean age was  $46.4 \pm 6.3$  months, and the mean age of the mothers

was  $27.1 \pm 5.1$  years. The mean number of decayed, extracted and filled teeth (deft) was  $13.7 \pm 3.2$  and only 1 child was caries free. Caries rates were significantly greater for children who had sugar added to the feeding bottle. Behaviours typically associated with ECC and caries activity, such as poor oral hygiene, and late weaning from the bottle, were also exhibited. Although 50% of children had enamel hypoplasia, no statistically significant differences in the amount of enamel hypoplasia and caries were found between those who received modified stosstherapy and those who did not. Not receiving stosstherapy was associated with later eruption time of the first primary tooth (7.2 vs. 5.0 months). Interviews revealed that, during pregnancy, many of the mothers only infrequently consumed foods rich in calcium and vitamin D, elements that are essential to the development of strong bones and teeth.

**Conclusions:** The mean deft for these First Nations preschoolers was high, and 50% had enamel defects. Although daily vitamin D supplementation of 400 IU during pregnancy has been known to reduce primary tooth enamel defects, the supplementation previously administered to participants in this study was not found to result in reduced enamel defects or caries. The high caries burden among children from this community reveals the need for effective prevention methods. It is important for pediatricians, family physicians, and other health service providers encountering very young children and expectant mothers to be cognizant of ECC and its ramifications, as their education efforts represent the first line of defence. ♦

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# Decreases in Occupational Exposure to Ionizing Radiation among Canadian Dental Workers

- Jan M. Zielinski, PhD •
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- Pierre R. Band, MD •
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## A b s t r a c t

**Objective:** To describe doses of ionizing radiation and their possible associations with mortality rates and cancer incidence among Canadian dental workers.

**Methods:** The National Dose Registry (NDR) of Canada was used to assess occupational dose of ionizing radiation received by dental workers. The NDR cohort includes 42,175 people classified as dental workers. Subjects in the NDR were linked to both the Canadian Mortality Database and the Canadian Cancer Database to ascertain cause of death and cancer incidence, respectively.

**Results:** The cohort consisted of 9,051 male and 33,124 female dental workers. A total of 656 incident cases of cancer and 558 deaths were observed. The standardized mortality ratio associated with all-cause mortality was 0.53 (90% confidence interval [CI] 0.49–0.57). The incidence of cancer among dental workers was lower than that for the Canadian population for all cancers except melanoma of the skin (for melanoma, the standardized incidence ratio was 1.46 [90% CI 1.14–1.85]). Occupational doses of ionizing radiation among dentists and dental workers have decreased markedly since the 1950s.

**Conclusions:** Dental workers receive very low doses of ionizing radiation, and these doses do not appear to be associated with any increase in cancer incidence; the increased incidence of melanoma is more likely related to other risk factors such as exposure to ultraviolet radiation from sunlight.

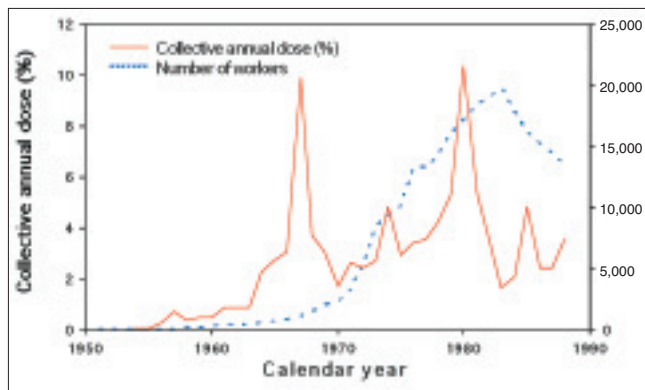
**MeSH Key Words:** cancer; dental staff; dentist; occupational exposure; radiation

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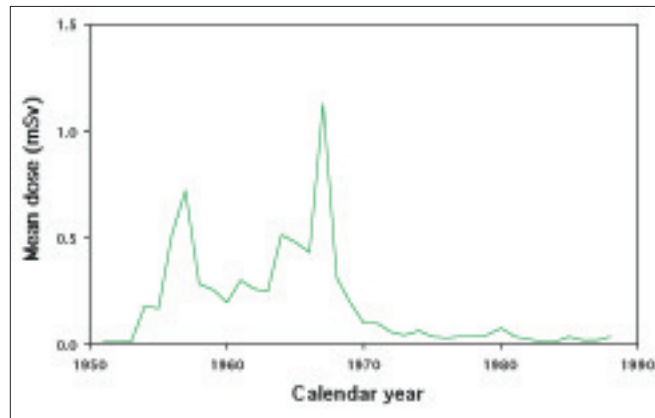
Ionizing radiation is a well-established risk factor for cancer.<sup>1–7</sup> However, despite the fact that most dental offices and clinics have x-ray machines that are in frequent use,<sup>8</sup> the exposure of dental workers to ionizing radiation and the associated potential cancer risk have been assessed in only a few studies. It appears that there has been a downward trend in the occupational dose of ionizing radiation received by dental workers, which provides evidence

of the efficacy of radiation protection measures.<sup>9,10</sup> Nonetheless, concerns remain about total-body radiation dose and the risk of cancer<sup>11,12</sup>; for example, one study suggested that dentists and dental assistants were at increased risk of papillary thyroid cancer.<sup>13</sup>

The purpose of this study was to determine the occupational doses of ionizing radiation and to examine possible associations with mortality rates and cancer incidence in a



**Figure 1:** Number of dental workers in the National Dose Registry cohort and their collective annual dose (as a percentage of total collective dose of 13.07 Sv) between 1951 and 1987.



**Figure 2:** Mean annual radiation dose received by dental workers in the National Dose Registry between 1951 and 1987.

cohort of dental workers listed in the National Dose Registry (NDR) of Canada.

## Materials and Methods

### *National Dose Registry of Canada*

The NDR, a database maintained by the Radiation Protection Bureau of Health Canada since 1950, contains records of occupational doses of ionizing radiation for over 500,000 individuals from about 24,000 organizations. The NDR, a major part of Health Canada's population health surveillance program, accounts for virtually all monitored radiation workers in Canada. Further details on the NDR are provided elsewhere.<sup>14</sup>

### *Cohort Definition*

The study cohort was derived from all 191,042 individuals in the NDR database whose sex, year of birth and dose information spanning the period 1951–1987 were recorded; of these, 42,175 were classified as dental workers, including dentists, dental assistants and hygienists. A retrospective dose history for each individual in the cohort was previously constructed by combining dose records for individuals over the entire study period.<sup>14–16</sup> Vital status and cause of death were determined by record linkage to the Canadian Mortality Database for the years 1951 to 1987.<sup>15</sup> Incident cases of cancer were identified by linkage to the Canadian Cancer Database,<sup>4</sup> derived from the National Cancer Incidence Reporting System for the years 1969 to 1987. Cases of non-melanoma skin cancer were excluded from the cohort because reporting procedures for this type of cancer have varied widely among provinces.<sup>4</sup> Disease and death codes were reconciled to the ninth revision of the *International Classification of Diseases*.<sup>17</sup>

### *Dosimetry*

Dosimetry information was obtained from the National Dosimetry Services of the Radiation Protection Bureau of Health Canada. External radiation dose, expressed in millisieverts (mSv), represents the amount of energy

absorbed per gram of tissue.<sup>4</sup> Individual doses recorded at frequencies ranging from biweekly to annually were combined to obtain annual doses for each member of the cohort. In cases where the recorded dose was below the detection limit of the radiation dosimeter used (generally  $< 0.20$  mSv), the value was recorded as zero.<sup>4,15</sup> The collective dose received by the cohort was the sum of all individual doses throughout the study period. Similarly, the collective annual dose was the sum of all individual doses recorded in a given year.

### *Statistical Methods*

Mortality rates and cancer incidence for dental workers were compared with those for the general Canadian population using standardized mortality ratios (SMRs) and standardized incidence ratios (SIRs). Associated confidence intervals were calculated under the assumption that numbers of deaths and incident cases of cancer follow a Poisson distribution.<sup>18</sup>

## Results

The cohort consisted of 9,051 men and 33,124 women. The number of dental workers in the NDR cohort peaked in the early 1980s and subsequently declined (**Fig. 1**). The collective annual dose reflects the percentage of the total collective dose of 13.07 Sv received by cohort members in any given year (**Fig. 1**). The mean annual dose received by dental workers reached a maximum around 1963 and then declined, reaching very low levels by 1975 and remaining at those low levels thereafter (**Fig. 2**). The mean lifetime cumulative dose among Canadian dental workers in the NDR cohort was 0.31 mSv. The mean annual dose for the period 1970–1987 was 0.045 mSv, which is over 50-fold less than the annual background radiation dose of 2.4 mSv.<sup>8</sup>

A total of 656 incident cases of cancer and 558 deaths were observed. The mortality rate among dental workers was lower than that for the general Canadian population, and the SMR was estimated at 0.53 (90% CI 0.49–0.57) (**Table 1**). The overall incidence of cancer within the cohort

**Table 1** Standardized mortality ratios (SMRs) for dental workers in the National Dose Registry cohort (1951–1987)

Cause of death	No. of deaths		SMR (90% CI)
	Observed	Expected <sup>a</sup>	
<b>Cancer</b>			
Tongue and mouth	2	2.8	0.71 (0.12–2.23)
Pharynx	1	3.2	0.31 (0.01–1.47)
Esophagus	2	4.9	0.41 (0.07–1.28)
Stomach	8	13.2	0.61 (0.30–1.09)
Colon	30	23.4	1.28 (0.92–1.74)
Rectum	3	8.1	0.37 (0.10–0.96)
Liver, primary	4	2.8	1.44 (0.49–3.29)
Liver, not specified	1	1.2	0.85 (0.03–4.01)
Gallbladder	1	2.5	0.40 (0.02–1.89)
Pancreas	13	13.1	0.99 (0.59–1.58)
Lung	29	69.8	0.42 (0.30–0.57)
Bone	2	1.6	1.28 (0.22–4.04)
Connective tissue	1	2.2	0.46 (0.02–2.18)
Melanoma	7	5.8	1.21 (0.57–2.28)
Female breast	39	36.2	1.08 (0.81–1.41)
Ovary	6	9.0	0.67 (0.29–1.32)
Uterus, including cervix	6	9.7	0.62 (0.27–1.22)
Prostate	7	8.6	0.82 (0.38–1.53)
Bladder	4	4.4	0.90 (0.31–2.07)
Kidney	2	6.1	0.33 (0.06–1.04)
Brain, nervous system	9	13.2	0.68 (0.36–1.19)
Thyroid	1	0.6	1.60 (0.06–7.58)
Non-Hodgkin's lymphoma	7	9.8	0.72 (0.34–1.35)
Hodgkin's disease	6	3.8	1.60 (0.70–3.15)
Multiple myeloma	4	3.6	1.12 (0.38–2.55)
Leukemia	17	13.5	1.26 (0.80–1.89)
Leukemia, excluding chronic lymphatic leukemia	15	11.8	1.27 (0.78–1.95)
Myeloid leukemia	7	6.7	1.05 (0.49–1.97)
Acute myeloid or monocytic leukemia	5	4.3	1.15 (0.45–2.43)
All cancers	224	296.5	0.76 (0.67–0.84)
<b>Noncancer</b>			
Accidents	101	222.4	0.45 (0.38–0.54)
Circulatory	165	339.7	0.49 (0.43–0.55)
Endocrine and metabolic	8	21.6	0.37 (0.18–0.67)
Genitourinary	2	9.7	0.21 (0.04–0.65)
Infective and parasitic	2	7.9	0.25 (0.04–0.79)
Respiratory	13	48.6	0.27 (0.16–0.43)
<b>All causes</b>	<b>558<sup>b</sup></b>	<b>1,059.1</b>	<b>0.53 (0.49–0.57)</b>

<sup>a</sup>The expected numbers of deaths were calculated on the basis of the mortality rates in the Canadian population.

<sup>b</sup>Total number of deaths includes 43 deaths in the noncancer category that were not analyzed.

was also lower than that in the Canadian population; the SIR was 0.87 (90% CI 0.82–0.93) (Table 2). For the majority of specific cancers, the SIR was less than 1.0 among dental workers; however, the incidence of melanoma was greater among dental workers (SIR 1.46, 90% CI 1.14–1.85).

## Discussion

Although several studies of dental workers have focused on exposure to mercury, anesthetic gases and infectious diseases, as well as on stress and allergic reactions to latex,<sup>9,11,19,20</sup> few studies have examined the potential risks

of occupational exposure to radiation. Direct radiation injury has been virtually eliminated by improvements in radiologic equipment and methods and radioprotection measures.<sup>9</sup> However, the potential effects of whole-body doses remain of concern,<sup>11</sup> with secondary radiation scattered from bones in the patient's head now representing the greatest source of radiation received by dentists and dental workers.<sup>10</sup>

Other than an increased SIR for melanoma, mortality rates and cancer incidence among dental workers were no greater than within the general Canadian population. To our knowledge, a greater incidence of melanoma among

**Table 2** Standardized incidence ratios (SIRs) for dental workers in the National Dose Registry cohort (1969–1987)

Type of cancer	No. of cancers		SMR (90% CI)
	Observed	Expected <sup>a</sup>	
Tongue and mouth	6	8.9	0.67 (0.29–1.33)
Salivary gland	5	3.0	1.65 (0.65–3.46)
Pharynx	1	7.3	0.14 (0.01–0.65)
Esophagus	2	5.3	0.38 (0.07–1.19)
Stomach	14	19.6	0.71 (0.43–1.11)
Colon	57	51.5	1.11 (0.88–1.38)
Rectum	30	27.8	1.08 (0.78–1.47)
Liver, primary	3	3.5	0.87 (0.23–2.24)
Pancreas	16	14.0	1.15 (0.72–1.74)
Nose	1	1.6	0.63 (0.02–2.96)
Lung	44	93.0	0.47 (0.36–0.61)
Bone	5	3.9	1.27 (0.50–2.67)
Connective tissue	11	7.6	1.44 (0.81–2.38)
Melanoma	50	34.2	1.46 (1.14–1.85)
Female breast	126	129.7	0.97 (0.83–1.13)
Ovary	22	24.0	0.92 (0.62–1.31)
Uterus and cervix	42	66.4	0.63 (0.48–0.82)
Prostate	30	34.7	0.86 (0.62–1.17)
Testis	10	6.3	1.58 (0.86–2.68)
Bladder	25	27.4	0.91 (0.63–1.27)
Kidney	14	15.5	0.90 (0.55–1.41)
Brain, nervous system	20	20.5	0.98 (0.65–1.42)
Thyroid	25	20.9	1.20 (0.83–1.67)
Non-Hodgkin's lymphoma	22	27.2	0.81 (0.55–1.15)
Hodgkin's disease	15	16.5	0.91 (0.56–1.40)
Multiple myeloma	6	6.0	1.01 (0.44–1.99)
Leukemia	26	21.0	1.24 (0.87–1.72)
Leukemia, excluding chronic lymphatic leukemia <sup>b</sup>	18	15.9	1.13 (0.73–1.68)
Myeloid leukemia <sup>b</sup>	12	11.0	1.10 (0.63–1.78)
Acute myeloid or monocytic leukemia <sup>b</sup>	7	6.7	1.05 (0.49–1.96)
Other cancers	28	39.4	0.71 (0.51–0.98)
<b>All cancers</b>	<b>656</b>	<b>750.8</b>	<b>0.87 (0.82–0.93)</b>

<sup>a</sup>The expected numbers of deaths were calculated on the basis of the mortality rates in the Canadian population.

<sup>b</sup>The individual numbers of observed cancers sum to more than the total of 656 observed cancers because the counts for chronic lymphatic leukemia, myeloid leukemia, and acute myeloid or monocytic leukemia were also included in the overall count for leukemia.

dental workers has not been previously observed, although medical workers exposed to x-rays have been reported to be at higher risk.<sup>5,21</sup> The elevated risk of melanoma observed in the present study is more likely related to ultraviolet sunlight exposure than to occupational exposure to ionizing radiation.<sup>4</sup> Because of the large number of cancer types examined in the present study, it is also possible that the elevated SIR for melanoma was due to chance.

The current study summarizes actual dose measurements for dental workers in Canada over a 40-year period. This study was limited by the fact that monitoring of dental workers was not compulsory throughout the entire study period and varied from province to province. As such, an unknown number of dental workers are missing from the cohort, and some dose records may be incomplete.<sup>15</sup> However, there is no reason to assume that the radiation dose received by monitored dental workers was systematically different from that for workers who were not monitored.

The dose of ionizing radiation received by Canadian

dentists and other dental workers has declined to very low levels. Continued adherence to established guidelines for occupational radiation exposure<sup>22</sup> is recommended as a means of protecting dental workers from the harmful effects of ionizing radiation. ♦

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# Foil Backing Used in Intraoral Radiographic Dental Film: A Source of Environmental Lead

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## A b s t r a c t

*The lead content of the foil backing of 4 types of intraoral film commonly used by dentists was 69% to 85%. An environmental issue exists because these foils are typically thrown out with regular refuse, even though recycling programs exist. For a new adult patient, a full-mouth radiographic series would generate 11.2 g of waste lead; for a 6-month checkup, waste lead would only be produced if radiographs were required. In an experiment that simulated the acidic conditions that might be expected in a landfill site, 3.5–4.4 mg of lead was released during 17-hour incubation in dilute acetic acid. When distilled double-deionized water replaced the acid, 1.0–2.2 mg of lead was released by the same types of foils. Human health concerns also exist when dental assistants handle lead foil while developing radiographs and fail to change their gloves or wash their hands before handling instruments and dental paraphernalia used in the mouth. Although the amount of lead introduced into the oral cavity would be relatively small, the elimination of sources of lead exposure, especially for children, is important.*

**MeSH Key Words:** dental radiography; environmental health; lead

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The proper disposal of potentially toxic waste material (e.g., mercury) generated during routine procedures in dental practice has been a contentious issue for at least the last 2 decades.<sup>1</sup> On June 6, 2000, the Canadian Council of Ministers of the Environment accepted a national target of a 95% reduction in mercury amalgam waste being discharged into the environment.<sup>2</sup> Environment Canada recognized that the standard was based on the precautionary principle because few data exist concerning the environmental consequences of mercury amalgam waste.<sup>3</sup> In contrast, we know of no Canadian legislation governing the disposal of dental lead, another waste generated by radiography in dental offices, even though numerous studies have shown that lead is detrimental to the environment and human health.<sup>4</sup>

Intraoral films are packaged with a sheet of lead foil to protect the film from backscatter and secondary irradiation.<sup>5</sup> Although recycling services exist,<sup>6</sup> dentists typically discard lead foil with regular refuse, which is typically deposited in landfills. In addition, if dental assistants do not wash their hands or change their gloves after processing intraoral films,

lead oxide might adhere to the gloves or hands and be introduced onto instruments and dental paraphernalia used in the mouths of patients. This is important because inorganic lead is easily dissolved in human saliva.<sup>7</sup>

Mounting evidence suggests that the current level of concern about blood lead may be inadequate in protecting the health of children.<sup>4,8</sup> The potential for lead exposure in patients visiting the dental office has also recently been reported by the United States Food and Drug Administration's Center for Devices and Radiological Health. Dental films stored in certain lead-lined film containers were identified as a potential source of lead exposure for patients and practitioners because of a white layer of approximately 80% lead that covered the dental film.<sup>9</sup> No mention was made of the problem of the lead foil itself.

In this study, we examined the potential for patients' exposure to lead related to the handling of lead foil by dental health professionals. We also determined the lead concentration of lead foils recovered from radiographic film commonly used in the dental profession and examined whether these films would

**Table 1** Average weight of lead foils and lead content of 4 common types of dental film

Film type <sup>a</sup>	<i>n</i>	Weight of lead foil; g ± SD	Average lead content; % ± SD <sup>b</sup>
Size 0	10	0.438 ± 0.002	81 ± 15
Size 1	10	0.533 ± 0.002	85 ± 14
Size 2	10	0.733 ± 0.013	84 ± 18
Occlusal <sup>c</sup>	10	2.920 ± 0.008	69 ± 13

<sup>a</sup>Sizes 0 and 1 are Kodak Insight film; size 2 is Kodak EKTASPEED Plus; and occlusal is Kodak Ultra-speed D Safety 1 Film, occlusal large.

<sup>b</sup>One or 2 outliers were excluded from the average. The very large dilution factor of 125,000–150,000 was likely one of the reasons for the rather low reproducibility, as both manual and spectrometer-activated dilutions were involved.

<sup>c</sup>This film type had a thin paper backing that could not be removed.

be of any environmental consequence under conditions that might be expected in a landfill site. The fate of toxic metals in landfill sites has not been adequately characterized.<sup>10,11</sup> Briefly, the degradation process begins with a short initial aerobic phase, followed by an anaerobic phase (anaerobic acid and methane production subphases), and finally the humic phase.<sup>10,11</sup> Because waste materials are not homogeneously distributed in landfill sites, different parts of a site will be at different stages of degradation.<sup>10,11</sup> The acetic acid leaching experiment incorporated into the present study accelerated the degradation of the lead foil in an effort to simulate the anaerobic acid subphase.

## Materials and Methods

Four types and sizes of intraoral dental film commonly used in Canada were examined: Kodak Insight, size 0 (Eastman Kodak Co., Rochester, NY); Kodak Insight, size 1; Kodak EKTASPEED Plus, size 2; and Kodak Ultra-speed D Safety 1 Film, occlusal large. Ten foils from each type of film were weighed (Table 1). Stainless steel scissors were used to cut a 15-mg sample (approximately) from each piece of dental foil. The samples were placed in labelled test tubes and 2.0 mL of ultra-pure nitric acid (HNO<sub>3</sub>) and 2.0 mL of distilled double-deionized water (DDW) were added to each sample. Samples were digested overnight (about 17 hours) at room temperature, then vortexed and placed into cylindrical heating blocks on hot plates. The samples were digested for 5–6 hours at 120°C, until dry. They were then dissolved in 5.0 mL of 0.1% HNO<sub>3</sub> and diluted 150,000-fold with 0.1% ultra-pure HNO<sub>3</sub> to bring the lead concentrations within a readable range. The samples were placed in a test tube rack and refrigerated until determination of lead by electrothermal atomic absorption spectroscopy (EAAS).

Size 0 and 2 lead foils, 10 each, were used in the acetic acid leaching experiment. Lead foils were loosely folded and placed individually in 2-mL cryovials containing 1.5 mL of 0.01% acetic acid. An additional 10 cryovials containing only 1.5 mL of 0.01% acetic acid served as controls. All samples were rotated using a vertical rotator (16-cm diameter, 20 rpm) for 17 hours at room temperature. The leachate and control samples were then diluted to 5 mL with 0.1% ultra-pure HNO<sub>3</sub>. The foil leachates were further diluted 125,000-fold with 0.1% HNO<sub>3</sub>. All solutions were placed in the refrigerator until determination of lead levels by EAAS. The experiment was repeated with DDW as the bathing solution.

Ghost Wipes for testing lead in dust (Environmental Express, Mount Pleasant, S.C.) were used in the lead foil handling experiment. Each of 10 wipes was torn into matching halves. One half of each was used to wipe a lead foil (size 0) 3 times using gentle pressure. Experimental and control halves were placed in individual test tubes containing 6 mL of ultra-pure HNO<sub>3</sub> and allowed to dissolve for 8 hours at room temperature. The mixture was then diluted to 5 mL with 0.1% ultra-pure HNO<sub>3</sub>, followed by another 50-fold dilution with 0.1% HNO<sub>3</sub>. The diluted digests were stored as described above until analysis.

Approximately 1 mL of each digest was poured into a cup and placed in the spectrometer carousel. The samples were analyzed using a Spectra AA 220 EAAS (Varian, Inc., Palo Alto, Calif.) with a graphite furnace. Before analysis and after every 10 samples, calibration curves were recorded to ensure that the spectrometer was accurate (± 10%). One blank sample and a certified reference standard (multi-element water standard, SRM 1640, National Institute of Standards and Technology, Gaithersburg, Md.) were run after every 10 samples. Reference standards were within 10% of the certified concentration. Duplicates of 10 samples were also measured and, on average, were within 5% of the original readings. All controls were below the detection limit of 0.3 µg/L.

Data for the acetic acid and DDW experiments were log transformed to equalize the variance of the data. Variation in lead levels between groups was assessed by analysis of variance (ANOVA) and a post-hoc test (Student-Newman-Keuls [SNK]).

## Results

The average lead content of the 4 types of dental foil ranged from 69% to 85% (Table 1). Substantial lead was released during leaching of the foils in dilute acetic acid and DDW. ANOVA revealed significant differences ( $p < 0.001$ ) between the 4 experimental groups. The amount of leached lead was significantly higher ( $p < 0.05$ ) in the dilute acetic acid than DDW: 4.4 ± 2.0 mg versus 2.2 ± 0.2 mg (size 0), corresponding to 0.80 ± 0.40% and 0.41 ± 0.04%, respectively; and 3.5 ± 0.5 mg versus 1.0 ± 0.5 mg (size 2), respectively, corresponding to 0.4 ± 0.06% and 0.12 ± 0.06% (Table 2). Although lead levels were significantly lower ( $p < 0.05$ ) in the DDW experimental groups compared with the acetic acid groups, the SNK test indicated that lead levels were not signif-

**Table 2 Leaching of lead foils with dilute acetic acid and distilled-deionized water**

Sample	n	Amount of lead leached	
		mg ± SD <sup>a</sup>	%
Size 0			
Acetic acid (0.01%)	10	4.4 ± 2.0*	0.80 ± 0.40
Distilled-deionized water	10	2.2 ± 0.2†	0.41 ± 0.04
Size 2			
Acetic acid (0.01%)	10	3.5 ± 0.5*	0.41 ± 0.06
Distilled-deionized water	9	1.0 ± 0.5‡	0.12 ± 0.06

<sup>a</sup>Numbers in this column that are followed by the same symbol are not significantly different ( $p > 0.05$ ; ANOVA, SNK); different letters indicate a significant difference ( $p < 0.05$ ).

**Table 3 Lead content of Ghost Wipes before and after being wiped on size 0 lead foil**

Sample	n	Amount of lead; µg ± SD <sup>a</sup>
Wiped on lead foil	10	6.8 ± 3.0 <sup>b</sup>
Unwiped	10	0.8 ± 0.7 <sup>b</sup>

<sup>a</sup>Detection limit is 0.01 µg.

<sup>b</sup>Lead contents of the wiped and unwiped samples were significantly different at the  $p < 0.05$  level.

icantly different ( $p > 0.05$ ) between the 2 acetic acid experimental groups. In the Ghost Wipes experiment, lead concentrations in the experimental samples ( $6.8 \pm 3.0$  µg) and the matched controls ( $0.8 \pm 0.7$  µg) were also found to be significantly different ( $p < 0.05$ ).

## Discussion

In the last 30 years, significant progress has been made in decreasing sources of environmental lead; however, as old sources are eliminated or regulated, new sources become apparent.<sup>7,12</sup> The lead foils used in oral radiography are typically discarded directly into waste containers and end up in landfill sites. We are unaware of any restrictions concerning the proper disposal of these lead foils in Canada. Furthermore, the lead contained in the foil can be leached from the landfills if no leachate collection system is in place. During the anaerobic acid subphase of the degradation process, microorganisms break down organic material, producing organic acids such as acetic acid that may result in a drop in pH.<sup>11,13</sup> Our acetic acid experiment clearly illustrates how mild acidification can cause significant dissolution of lead from radiographic foil in only 17 hours. This experiment is a simplification of what occurs at landfill sites; the alkalinity of waste material (e.g., carbonate minerals, silicate minerals, aluminium, iron) may be sufficient to buffer acid-producing processes (e.g., oxidation of sulfides, degradation of organic matter) and acidic precipitation.<sup>11</sup> Nevertheless, lead levels as high as  $2.6 \times 10^3$  µg/L have been reported in leachate samples originating from closed landfill sites.<sup>14</sup>

The amount of lead waste produced by a dental office can be significant. For a new patient examination (adult), a full-mouth series of films may include 14 periapical radiographs using size 2 film and 2–4 bitewing radiographs with size 2 film.<sup>15</sup> Based on data from the current study, as much as 11.2 g of lead waste would be produced in the course of examining one new patient. The amount of lead waste produced (if any) at a recall appointment will vary because the need for radiographs varies from patient to patient.<sup>16</sup> However, the amount of lead produced annually by the dental profession may be substantial.

In addition to environmental concerns, human health issues may also arise. Results from the handling experiment clearly show that patients may be exposed to lead if dental assistants processing radiographs do not change their gloves or wash their hands before handling instruments and dental paraphernalia used in the mouth. The amount of lead available would be proportional to the number of films processed and the amount of handling of the lead foil before handling instruments and dental paraphernalia and patient interaction. Although the amount of lead transferred to a patient may be minimal (about 6 µg; Table 3), it is of concern especially with respect to children, who have been reported to absorb approximately 35% of the lead they ingest.<sup>17</sup> The level of lead in children's blood that is of medical concern is constantly being lowered.<sup>4,8</sup> Thus, the dental profession is morally obligated to minimize exposure to such toxicants. Further, environmental lead may be a factor in the disproportionately high dental caries burden reported in the economically disadvantaged portion of North American society.<sup>18,19</sup> The former president of the Canadian Dental Association has stated that "as a group, we [dentists] want to act responsibly to minimize the environmental impact of the dental practice"<sup>20</sup> while protecting human health. This objective can be achieved.

## Conclusions

Reducing patient exposure can be achieved effectively by changing gloves or washing one's hands after processing intraoral radiographs. With respect to the environmental issue, lead foil recycling programs exist, but must be used by dentists. Moreover, the use of direct digital radiography would eliminate both the need for intraoral dental film with lead foil and

the subsequent wet processing of the film using chemicals (note, developer and fixer are typically dumped into the drain after use).<sup>21</sup>

Dentists have a moral and professional responsibility toward the dental as well as general health of patients in their care. This should extend beyond the radiation safety procedures normally adopted within the dental office for specific procedures to a more generalized consideration of the environmental impact of the potentially hazardous waste products from these procedures. The various national dental associations, worldwide, should engage in a voluntary movement toward more environmentally friendly alternatives with regard to the disposal of dental lead foil, as was seen with the mercury amalgam waste issue in Canada and elsewhere. ♦

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# Barodontalgia as a Differential Diagnosis: Symptoms and Findings

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## A b s t r a c t

*This paper provides a review of the literature concerning the etiology and manifestations of barodontalgia, as well as important clinical considerations for its management. Barodontalgia is characterized by exposure to a pressure gradient, such as that experienced by underwater divers, aviation personnel and air travellers. This form of dental pain is generally marked by a predisposing dental pathology such as acute or chronic periapical infection, caries, deep or failing restorations, residual dental cysts, sinusitis or a history of recent surgery. Studies indicate that severity of barodontalgia and the resulting deterioration of dental health correlates with duration of barometric stress. Restorative materials are also affected by pressure gradients. Resin is indicated as a luting agent of choice for cementing fixed prostheses in populations at risk for barodontalgia. Under the influence of pressure gradients, resin cements maintain original bond strength and demonstrate the least amount of microleakage compared with other cements. The key to avoiding barodontalgia is good oral health. Clinicians must pay close attention to areas of dentin exposure, caries, fractured cusps, the integrity of restorations and periapical pathology in those at risk. The Fédération dentaire internationale describes 4 classes of barodontalgia based on signs and symptoms and provides specific and valuable recommendations for therapeutic intervention.*

**MeSH Key Words:** aerospace medicine; barotrauma/complications; diving/injuries; toothache/etiology

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During World War II, tooth pain experienced by air crew in flight was given the name *aerodontalgia*. However, as this tooth-related pain was also observed in divers, a broader, more appropriate term, *barodontalgia*, was subsequently given to this phenomenon.<sup>1</sup> Barodontalgia, which affects air crew and aircraft passengers as well as underwater divers, is pain or injury affecting teeth due to changes in pressure gradients.<sup>2</sup> Boyle's Law, which states that "at a given temperature, the volume of a gas is inversely proportional to the ambient pressure," may be used to explain barodontalgia.<sup>2</sup> Specifically, as a person descends deeper and deeper below the water surface, pressure exerted on the diver by the water increases and reduces the volume of gases in enclosed spaces such as teeth and sinuses. The same law applies if a person climbs to high altitudes (in flight); in this case, outside pressure decreases, permitting the volume of gases to increase. A problem arises when the enclosed spaces containing gases cannot expand or contract to adjust the internal pressure to correspond to the outside pressure. Aircraft personnel and passengers travelling in non-pressurized cabins are especially at risk.<sup>2</sup>

The importance of understanding, preventing and, where necessary, treating barodontalgia is especially evident when considering pilots of high performance aircraft. A study using a pressure chamber as a flight simulator revealed that in some instances barodontalgia was severe enough to affect flight safety.<sup>3</sup> In the past, barodontalgia was especially problematic for travellers during military flights where cabins were not sufficiently pressurized. Currently, and of particular relevance to the general public, are effects occurring during normal commercial flights and recreational diving. These range from a simple sharp or squeezing tooth pain to rupture of the alveolar mucosa.<sup>2</sup> The phenomenon begins to occur at an altitude of approximately 3,000 m and at a water depth of 10 m where the ambient pressures are 0.75 and 1 atmosphere, respectively.<sup>4</sup>

### Etiology

The cause of barodontalgia has been investigated for many years. Kollman<sup>3</sup> refers to 3 important hypotheses to explain this phenomenon: expansion of trapped air bubbles under a root filling or against dentin that activates nociceptors;

stimulation of nociceptors in the maxillary sinuses, with pain referred to the teeth; and stimulation of nerve endings in a chronically inflamed pulp. He strongly supports the last 2 hypotheses and states that, for the latter, histologic evidence shows that chronic pulpal inflammation can still be present even when a thin dentin layer covers the pulp, for example, as in a deep cavity preparation.

Most cases of barodontalgia are associated with teeth already affected by some sort of pathology.<sup>1</sup> Clinically, people affected by barodontalgia were found to have one or more of the following: acute or chronic periapical infection, caries, deep restorations, residual dental cysts, sinusitis and a history of recent surgery.<sup>5</sup> The latter is of particular concern for people wearing oxygen regulators when diving using self-contained underwater breathing apparatus (scuba) or when wearing oxygen masks during high-performance aircraft flights due to the risk of air being pushed into the tissues. Sinusitis may also contribute to barodontalgia, although it may not be related to any tooth pathology. For example, Holowatyj<sup>1</sup> described a patient as having pain in his left infraorbital area, as well as in the maxillary left canine and maxillary left first molar during both a commercial flight and while flying a Tutor jet trainer. Although no tooth pathology was present, the patient did have mild congestion in his left maxillary sinus, with referred pain in his maxillary teeth. Barosinusitis is distinguishable from barodontalgia, as the former will always occur on descent, whereas the latter always begins on ascent.<sup>5</sup> Recognizing that symptoms only appear to arise in teeth (or sinuses) affected by some type of pathology, researchers concluded that a pressure gradient is a contributing factor, not the actual cause of the problem.<sup>2</sup>

Calder and Ramsey<sup>6</sup> tested whether large, rapid pressure changes generated within a capsule would create visibly detectable damage to extracted restored and nonrestored teeth. Of 86 extracted teeth subjected to the high-pressure environment, only 5 showed visible evidence of trauma. However, all 5 had inferior-quality restorations (i.e., deteriorating or leaking restorations present before extraction or placed after extraction). None of the unrestored teeth, regardless of the presence of caries, suffered any damage, suggesting that failing restorations play a major role in the occurrence of physical damage.

## Underwater Diving

Scuba diving is one of the fastest growing sports in the world.<sup>7</sup> Thus, it is important for dentists to be aware of dental-related problems that may arise for scuba divers. The most common way for air from the pressurized tanks to enter a tooth is by being forced in through carious lesions or defective margins.<sup>7</sup> As atmospheric pressure decreases during ascent, trapped gases may expand and enter dentin tubules, thereby stimulating nociceptors in the pulp or causing the movement of pulp chamber contents through the apex of the tooth, also causing pain.<sup>7</sup>

In their study, Calder and Ramsey<sup>6</sup> mention that the

physical properties of the gas mixture used during deep sea diving may contribute to barodontalgia. In scuba tanks, oxygen's natural diluent gas, nitrogen, is replaced by helium, resulting in a gas of lower viscosity. This gas can enter tissues, including teeth, and can sometimes become trapped in closed spaces, such as the pulp chamber and root canal. There are 2 mechanisms by which gases can be trapped in spaces: if there is a space between a tooth and its restoration, gas may be forced into it during an increase in pressure; and dissolved gas may diffuse from tissues into spaces as pressure decreases. Consistent with Boyle's Law, trapped gas will expand and the resulting stress may cause tooth fracture. This process has been called *odontocrexsis*, a Greek word meaning tooth explosion.

## Physical Manifestations

Although understanding the etiology of barodontalgia is of great importance, its physical manifestations also deserve some attention. In their study, Goethe and coworkers<sup>8</sup> attempted to identify early and late damage due to barodontalgia by examining 50,000 tooth-related clinical problems (e.g., carious lesions, tooth trauma, deteriorating restorations) at the Nautical Medical Institute of the German Navy at Kiel. Among these findings, 13,618 were from 2,580 navy divers, frogmen and submariners. The patients were divided into 2 categories: those working under normal atmospheric pressure (1,291 submariners) and those working under changed atmospheric pressure (1,289 divers and frogmen). Navy divers spend an average of 200–300 hours a year under water whereas frogmen usually spend longer times at shallower depths.

An initial examination revealed that overall, divers and frogmen had better oral health than submariners. Dental findings were reviewed at 3, 6, and 9 years. At 9 years, deterioration in the teeth of navy divers and frogmen had occurred at significantly higher rates than those of the submariners in terms of missing or crowned incisors, canines, premolars and molars. More specifically, although they were healthier at baseline, frogmen were in the poorest state of dental health after 9 years, surpassing even the navy divers. This suggests a correlation between the deterioration of dental health and increased exposure to barometric stress.

To further support these results, another longitudinal study<sup>8</sup> was conducted on navy divers and submariners from the time of their entry into the navy until they had served for more than 10 years. Once again, the dental health status of navy divers was initially slightly better, but after 10 years, they demonstrated a 300% increase in missing teeth and a 900% increase in the placement of crowns. The submariners' examination at 10 years revealed an increase of only 186% missing teeth and 375% crown placement. These findings confirm that navy divers' teeth have a faster rate of deterioration than submariners'. Again, this is attributed to higher levels of barometric stress.



## Dental Materials

We have described the signs and symptoms of barodontalgia, such as pain and physical damage to the oral tissues, but it would also be an advantage to the clinician to know the effect of pressure changes on certain dental materials in terms of bond strength and microleakage. The following outlines important considerations for cast-crown placement in people who regularly engage in activities associated with barometric stress.

Lyons and coworkers<sup>4</sup> examined whether pressure cycles would cause microleakage in teeth with full cast crowns cemented with zinc phosphate cement, tri-cured glass ionomer cement or a resin cement. They also investigated whether the retention of these crowns would be affected. Sixty single-rooted extracted premolars were divided into 3 groups of 20 teeth according to the cement used. Each group was then subdivided into 2 groups of 10, an experimental group and a control group. Each experimental tooth was then subjected to 15 compression cycles, ranging from 0 to 3 atmospheres, in a pressure chamber. Maximum pressure was attained in 3 minutes and maintained for 3 minutes, and decompression occurred over 3 minutes. Microleakage was detected in all experimental teeth where the crowns were luted with zinc phosphate cement. Seven teeth in the glass ionomer experimental group showed microleakage during pressure cycling, and no microleakage was detected in the resin cement group.

Lyons and coworkers offer several explanations for the microleakage in the glass ionomer and zinc phosphate groups, including volumetric contraction or internal stress within the materials, or porosities caused by mixing that may have expanded and contracted during pressure cycling. They further suggest that microleakage may not have occurred in the resin cement group because the dentinal tubules were obstructed by resin tags, or simply because fracture did not occur because the material was flexible.

The tensile bond strength of the cements was also tested using a universal testing machine (with a speed of 0.5 mm/minute and a 100-kg load).<sup>4</sup> Results indicated that the force required to dislodge the crowns in the experimental group cemented with zinc phosphate was only a tenth that of the controls, and that for glass ionomer was reduced by a half compared with its controls. Pressure cycling did not affect the bond strength of the resin cement group. Based on the results of this study, it is possible that barodontalgia may develop as a result of microleakage following a reduction in lute bond strength during or following pressure cycling. Lyons and coworkers suggest that dentists consider using a resin cement when luting fixed prostheses in patients who will be exposed to significant variations in pressure.

## Recommendations

Although barodontalgia is not common, it should not be dismissed as unimportant, as it can pose a serious safety risk to divers, submariners, pilots and airline passengers. The Fédération dentaire internationale (FDI) has classified barodontalgia into 4 groups according to its signs and symptoms; from moderate to severe, they are acute pulpitis, chronic pulpitis, necrosis of the pulp and periapical abscess or a cyst.<sup>8</sup> Each category contains a description of clinical symptom, findings and therapy. FDI also recommends an annual checkup for divers, submariners and pilots, with oral hygiene instructions from dentists familiar with their dental requirements. In addition, patients should not dive or fly in non-pressurized cabins within 24 hours of a dental treatment requiring anesthetic or 7 days following a surgical treatment.<sup>8</sup>

The key feature in avoiding barodontalgia is good oral health. When dealing with patients involved in diving or aviation, clinicians should pay close attention to areas of dentin exposure, caries, fractured cusps, fillings and periapical pathology.<sup>2</sup> If a patient arrives in the office complaining of symptoms of barodontalgia, the examiner should establish whether there is a history of recent flying or diving. Examination should include an estimate of the age of restorations in the suspected area, screening for caries

*Barodontalgia can pose a serious safety risk to divers, submariners, pilots and airline passengers.*

and poor-quality restorations, a percussion test on suspected teeth, an evaluation of the response to electrical stimulation or heat and cold, as well as a radiographic examination.<sup>4</sup> One clinical benefit of barodontalgia is that it may help a dentist locate early caries, leaking restorations and periodontal abnormalities.<sup>5</sup> Also of clinical importance, the placement of a zinc oxide eugenol (ZOE) base was found to prevent barodontalgia when reversible pulpitis was the underlying cause.<sup>1</sup> This is attributed to the well-known sedative affects of ZOE. Another study<sup>3</sup> suggested that when treating people who are subjected to large pressure changes, it is best to avoid procedures such as pulpectomy and capping of an exposed pulp. Rather, endodontic treatment is indicated.

## Conclusion

According to the literature, barodontalgia is a rather rare phenomenon. However, Kollmann<sup>3</sup> has suggested that the incidence of barodontalgia may be underestimated. For example, aviators may be reluctant to report pain as they could be refused flying certificates.

It appears that controversy still exists as to the exact etiology of barodontalgia and the mechanisms of the pain. Nevertheless, research has provided useful ways to anticipate, recognize and treat the phenomenon, thereby preventing what could easily turn into a tragedy. Agreement has been reached on 2 factors: the influence of a pressure

gradient and some sort of pathology in oral tissues or sinuses must both be present to result in symptoms of barodontalgia. Certain populations have been specifically identified as having a high risk for barodontalgia. Dentists will be able to provide more efficient diagnosis and care by referring to FDI guidelines, as well as knowing how certain dental materials respond to pressure gradients. Although its occurrence has been known for some time, more research to improve the understanding of barodontalgia would be useful for those providing care. Understandably, many studies are military based because of the potential impact of barodontalgia on the professional activities of pilots and divers. With a significant number of these professionals in the military, there is an optimum environment for carrying out well-controlled research and follow-up. However, a richer understanding of diagnosis and treatment challenges would undoubtedly be gained from research broadened to include recreational divers and civilian aviators. ♦



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# Diagnostic Challenge

*The Diagnostic Challenge is submitted by the Canadian Academy of Oral and Maxillofacial Radiology (CAOMR). The challenge consists of the presentation of a radiology case.*

*Since its inception in 1973, the CAOMR has been the official voice of oral and maxillofacial radiology in Canada. The Academy contributes to organized dentistry on broad issues related to dentistry in general and issues specifically related to radiology. Its members promote excellence in radiology through specialized clinical practice, education and research.*



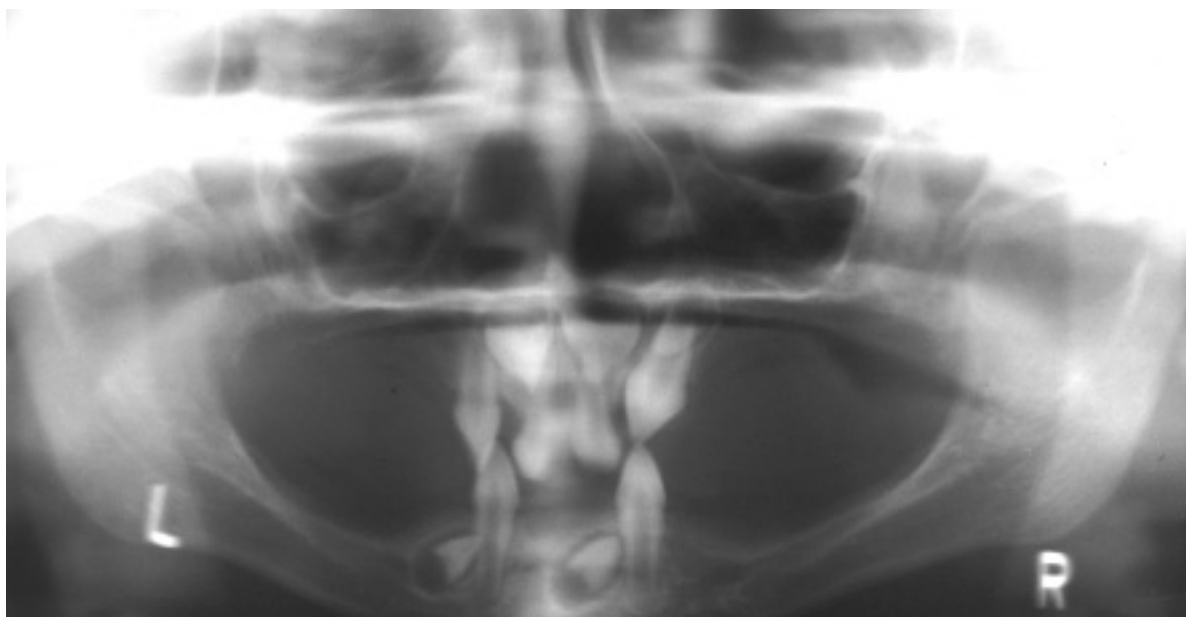
## CAOMR Challenge No. 17

Robert E. Wood, DDS, PhD, FRCD(C)

### Case History

A mother brings her 3-year-old to your rural office because she is concerned that her child's teeth are late coming in and are "funny-looking and pointy." This is her only child and she is uncertain as to the normal develop-

ment of the teeth. You examine the boy's mouth and note the absence of the normally contoured alveolar processes. The patient also appears to have underdeveloped upper and lower jaws. The teeth that are present are indeed pointed. You decide to take a panoramic radiograph. ➤



### Questions

1. What are your observations?
2. What can you tell the mother about her child's prospects of developing teeth?
3. What systemic conditions are associated with your findings?
4. Based on the radiographic evidence, what other clinical findings might you wish to obtain?

(See page 44 for answers)

## Answers to CAOMR Challenge No. 17

### 1. What are your observations?

The key clinical and radiographic observations are the lack of deciduous teeth and the lack of developing teeth. The teeth that are developing are conical in shape, with pointed crowns and small roots. The alveolar processes of the maxilla and mandible are smaller than expected and the maxillary sinuses about the alveolar ridge in the maxilla. This relationship of the sinus to the jaw bone is uncommon in someone so young. Tooth buds are visible in the anterior mandible and maxilla, but they are completely absent in the posterior region.

### 2. What can you tell the mother about her child's prospects of developing teeth?

The prospect of this child developing new teeth is exceedingly low. Plans will have to be made to provide adequate teeth to help this child chew and to ensure proper development of the jaw. By 3 years of age, one would expect most deciduous teeth to have erupted. This case should be referred to a pediatric dentist or a dental clinic at a children's hospital. The mother's physician should also refer her for genetic counselling.

### 3. What systemic conditions are associated with your findings?

Partial anodontia is associated with a number of conditions, many of which can be ruled out by taking a thorough medical history. For example, teeth may not develop if a patient has had radiation therapy involving the jaws early in the development of the tooth follicles.

Common reasons for oligodontia or partial anodontia:

- previous extraction
- idiopathic anomaly
- ectodermal dysplasias
- previous radiation therapy
- trisomy 21

Uncommon conditions linked to oligodontia or partial anodontia:

- chondroectodermal dysplasia
- congenital unilateral facial hypoplasia
- incontinentia pigmentii
- oral-facial-digital syndrome type II
- oculodental osseous syndrome
- oculomandibulodyscephaly
- Rieger's syndrome (oligodontia and primary mesodermal iris dysgenesis)
- PHC (Böök) syndrome

- craniofacial dysostosis
- Ehlers-Danlos syndrome
- focal dermal hypoplasia syndrome
- pyknodysostosis
- progeria
- hypoparathyroidism
- inverted Marfan syndrome

This patient has ectodermal dysplasia.

### 4. Based on the radiographic evidence, what other clinical findings might you wish to obtain?

Many of the conditions listed above can be ruled out by simple examination, further testing and genetic studies. Contrary to what we think we know about ectodermal dysplasia, it is not one disease but a group of closely related conditions. We simply don't know how this group of hereditary disorders is transmitted from one generation to the next. Recent studies have shown that this disease has a myriad of causes. Some authors have suggested that there may be as many as 170 types of ectodermal dysplasias. When I was in dental school (some 20 years ago!), it was assumed that children diagnosed with ectodermal dysplasia had no sweat, sebaceous or mucous glands, little hair, dystrophic fingernails and few or no teeth. It would be prudent to check for all these symptoms. This child should be referred to his family doctor for further investigation. There are reports of patients diagnosed with ectodermal dysplasia being rehabilitated dentally using implant-retained prostheses. ✦

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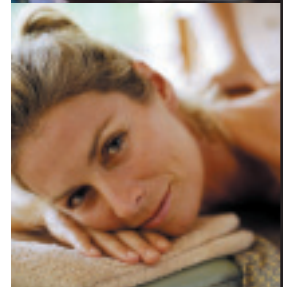
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*The Point of Care section of JCDA answers everyday clinical questions by providing practical information that aims to be useful at the point of patient care. The responses reflect the opinions of the contributors and do not purport to set forth standards of care or clinical practice guidelines. Readers are encouraged to do more reading on the topics covered. If you would like to submit or answer a question, contact editor-in-chief Dr. John O'Keefe at [jokeefe@cda-adc.ca](mailto:jokeefe@cda-adc.ca).*

## Question 1

How do I diagnose degenerative joint disease (osteoarthritis) of the temporomandibular joint?

Osteoarthritis is one of the most common arthritides affecting the temporomandibular joint (TMJ). Although the term “degenerative joint disease” is often used synonymously with osteoarthritis, it is simply a descriptive term that does not identify the cause. Degenerative joint disease of the TMJ is thought to be a manifestation of an imbalance between adaptive (remodelling) and nonadaptive (degenerative) responses. When active bony degeneration and pain accompany the condition, it is often referred to as osteoarthritis. As bony remodelling occurs, the condition may become stable, and it is then referred to as osteoarthrosis.

Generally, 8% to 12% of patients with a TMJ disorder who present to our clinic receive a diagnosis of degenerative joint disease. A large proportion of these patients are post-pubescent to premenopausal females. The condition can occur unilaterally or bilaterally. Typically, there is a destructive phase lasting approximately 12 to 18 months, followed by a 12- to 18-month reparative and healing phase (when the condition “burns out”). This pattern is quite different from that observed with osteoarthritis of other joints of the body (e.g., knee joint), which typically affects older women and men and in which the degenerative process often progresses, leading to disability and joint replacement.

Etiological factors include acute trauma (e.g., direct blow to the chin), mechanical overloading of the joint and internal derangement (particularly with disc deformation and perforation). Occlusion remains to be proven as a causal factor, although secondary occlusal changes may accompany TMJ degenerative changes.

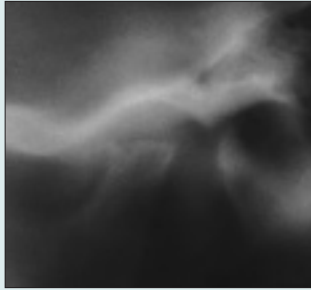
Important clinical characteristics of active degeneration include limited mandibular movement, joint pain during function, secondary tenderness on palpation of the TMJ capsules and masticatory muscles, and joint crepitation, but these features are not found in all patients. For example, although joint crepitation is a good predictor of degenerative joint disease, some TMJs affected by degenerative joint disease may not reveal crepitation on examination.

Advanced imaging is required for definitive diagnosis. Panoramic and plain film imaging (e.g., transcranial, transpharyngeal and transorbital projections) may identify

gross TMJ changes, but these methods are of limited diagnostic value because of anatomical superimposition, beam angulation and magnification issues that prevent accurate display of the osseous components. Tomography, specifically axially corrected tomography, is considered a gold standard for assessing the osseous components of the TMJ. Cone-beam volumetric tomography, which incorporates computer acquisition to create 3-dimensional, anatomically accurate visualizations, has recently become available. In addition to producing detailed, distortion-free images of the bony components of the TMJ, the average cone-beam scan results in a considerably lower dose of radiation than that produced during conventional and computed tomography.

Figure 1 displays an axially corrected tomographic image of the left TMJ (sagittal view) of an 11-year-old girl referred to our clinic in May 1999. The noticeable loss of bone and the irregular shape of the left condyle are clearly evident relative to the normal right TMJ (Fig. 2). The patient received nocturnal splint therapy specifically designed to provide orthopedic stability, glucosamine sulphate (1000 mg twice a day) and pain medication during symptomatic periods, and was re-evaluated at 8- to 12-week intervals. Two years later the left TMJ exhibits condylar remodelling, flattening and sclerosis of the articular eminence (Fig. 3). In August 2004 (Fig. 4) further osseous remodelling and reduction in size of the condyle are evident, but these most recent radiographs have been interpreted as showing no further signs of active degeneration (the condition has “burned out”), and the patient is now completely asymptomatic. Given this stabilization of osseous components and symptoms, the patient will be reassessed by our multidisciplinary team with a view to decisions on orthodontic and surgical therapy to correct an orthopedically unstable bite relationship.

Once a diagnosis of degenerative joint disease has been confirmed, treatment includes, as appropriate, patient education, with ample reassurance that the condition is generally self-limiting; instruction in self-care management for temporomandibular disorders (e.g., soft food diet,



**Figure 1:** Active bony degeneration of the left temporomandibular joint (TMJ).



**Figure 2:** The right TMJ osseous structures are normal.



**Figure 3:** The left TMJ exhibits condylar remodelling, flattening and sclerosis of the articular eminence.



**Figure 4:** End-stage degeneration of the left TMJ.

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minimizing parafunctional habits); physiotherapy to increase joint mobility; use of nonsteroidal anti-inflammatory drugs (NSAIDs), preferably a COX-2 inhibitor, 3 of which are available on the Canadian market today (many over-the-counter NSAIDs adversely affect joint healing with long-term use); long-acting opioids; and long-term therapy with a nocturnal splint appliance to regain or maintain orthopedic stability. Intra-articular injections of steroids and arthrocentesis are indicated for certain patients but are rarely required in our experience. Most patients are advised to use the food supplement glucosamine sulphate, which has been shown by our own clinical research to be a useful pharmacological adjunct for adult patients with TMJ degenerative joint disease. ♦



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*For more information on the University of Alberta's TMD/Orofacial Pain Residency Program, contact Dr. Thie or visit the department of dentistry Web site at [www.dent.ualberta.ca](http://www.dent.ualberta.ca).*

## Question 2 Is an electronic apex locator useful in endodontic therapy?

The goal of orthograde endodontic therapy is to chemo-mechanically clean, shape, disinfect and fill the entire root canal system, preparatory to sound coronal restoration. Confining the instrumentation, irrigation and obturation procedures to the root canal system (thus avoiding the periapical tissues) is generally accepted to result in more

predictable and comfortable root canal therapy. This can only be accomplished if the length of the canal space (i.e., the position of the apical terminus) is determined accurately.

In our opinion, the apical terminus of the canal is located where the periodontal and pulpal tissues meet. Theoretically (and schematically), this point has often been

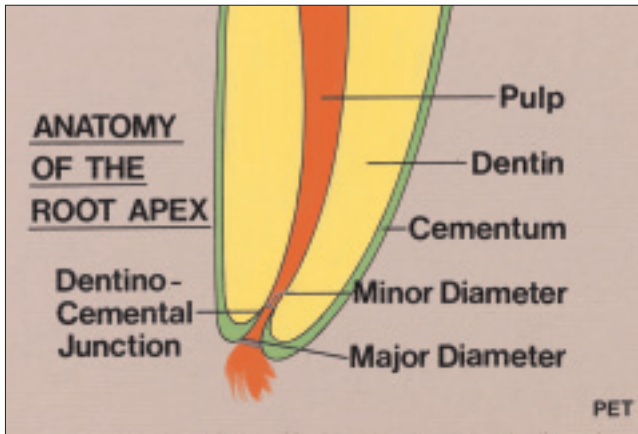


Figure 1: Anatomy of the root apex.

depicted as the “apical constriction” or the “minor diameter” of the root, which may or may not coincide with the cementodentinal junction (Fig. 1). In reality there is great variance in the morphology of the apical constriction and its position relative to the apical foramen and the radiographic apex.

Traditionally, a number of methods were used to determine the working length, including tactile sensation, blood or moisture on a paper point and radiography. Clinicians use this information, along with knowledge about root apex anatomy, to estimate the location of the apical constriction. Unfortunately, radiographs do not always accurately represent the apical anatomy. Difficulties include the superimposition of anatomic structures, the density of bone or the thinness of root apices, curvatures off the radiographic plane and variations in operator interpretation. In addition, cemental deposition, anatomic features and radiographic angularity may lead to incorrect conclusions.

Electronic apex locators were developed to aid in precisely locating the apical constriction. Since the first-generation instruments were introduced in 1969, technological advances have constantly improved the reliability, efficiency and versatility of these machines. The current fourth-generation instruments can determine the position of the apical constriction with an accuracy of up to 96%. These instruments are generally not affected by fluids within the canal and can be used with all types of files.

Although highly accurate, these instruments have limitations and must be used with care. Inaccurate readings can result if any of the following conditions are present:

- contact of the file with caries or metallic restorations
- flooding of chambers of multirouted teeth with irrigant (especially if the irrigant is electroconductive)

- lack of apical patency
- large apical diameters (caution is advised when apical constrictions are affected by resorption, apicoectomy or lack of development)
- presence of lateral canals, canal intersections or perforations
- technical difficulties, such as weak batteries and faulty connections.

In addition, it may be prudent to avoid using electronic apex locators in patients with cardiac pacemakers, although the evidence regarding possible problems in this situation is still inconclusive.

When used prudently, electronic apex locators offer many advantages. Most important is their accuracy, which may be even greater than that of radiography. Endodontic procedures can be performed more efficiently and are more comfortable for the patient because fewer radiographs are required. The patient’s radiation exposure is thus reduced, which is particularly beneficial for pregnant women, sedated or physically handicapped patients, and young patients. In addition, these instruments can help the clinician to differentiate between perforations and canals.

In summary, we feel that the reliability and accuracy of electronic apex locators make them useful adjuncts to endodontic therapy. They are helpful for determining the precise position of the apical constriction and thus in measuring working length. Radiography offers the advantage of revealing the canal curvature and provides a medicolegal record of treatment. Together, these techniques offer the best chance of successful case management. ♦



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### Question 3

Is it better to provide endodontic treatment in a single appointment or in multiple appointments?

Completing orthograde endodontic therapy in a single patient visit appears to be increasing in popularity. Although single-appointment therapy may be technically feasible, provided enough time is available, the question remains whether such an approach is prudent in all cases.

The trend to single-visit therapy relates to the considerable potential advantages to both clinician and patient:

- **Efficiency:** The dentist does not have to re-familiarize himself or herself to the patient's particular anatomy or landmarks.
- **Convenience:** The patient does not have to endure the discomfort of repetitive local anesthesia, treatment procedures and postoperative recovery.
- **Economics:** Shorter chair time and fewer materials increase the dentist's profitability. The patient misses less work and incurs fewer extra costs, such as travel and parking.
- **Patient management:** Most patients prefer to have their treatment completed as quickly as possible, and apprehensive patients derive special benefits from single-visit treatment. In some cases, health considerations favour single appointments (e.g., when prophylactic antibiotics or sedation is required)
- **Restorative consideration:** Prompt completion of endodontic treatment may be required to allow immediate placement of a coronal restoration (immediate post-core placement contributes to the success of treatment by ensuring an effective coronal seal).

These advantages, although attractive, would not be persuasive if clinical results were compromised or the incidence of postoperative pain or swelling increased. In this regard, several studies have compared single-visit and multiple-visit endodontics in terms of success rates and pain for 2 categories of cases:

- **Category 1:** vital, noninfected cases and nonvital traumatic cases without signs of apical periodontitis
- **Category 2:** infected cases with evidence of apical periodontitis (periapical radiolucency, swelling, exudates).

One-appointment treatments can be carried out predictably for category 1 cases as long as tooth isolation, thorough mechanical instrumentation, irrigation with sodium hypochlorite, complete obturation and coronal restoration can be done as soon as possible. Rotary instrumentation has made this less tedious. There is also a higher success rate and fewer procedural problems (such as canal straightening) when less experienced operators use the NiTi rotary systems.

For infected cases (category 2), immediate attention should focus on disinfection of the canals. Current evidence suggests that mechanical instrumentation be completed at the first visit with sodium hypochlorite irrigation. A combination of calcium hydroxide and chlorhexidine should be placed in the canals for 1 to 4 weeks. Obturation can be done when clinical symptoms subside (pain, swelling) and there is no apical exudation.

The role of bacteria is of paramount importance in endodontic disease. Kakehashi and others have demonstrated that healing and repair were predictable in the absence of infection. For treatment of noninfected vital teeth, bacteria are absent and we maintain an aseptic environment to avoid introducing microorganisms into the root canal system. Such cases should undergo single-visit therapy. Controversy lingers in cases of infection, the question being whether we can adequately clean and disinfect in one appointment. What the evidence shows is that only a combination of effective mechanical cleaning and shaping, irrigation and use of an antibacterial dressing such as calcium hydroxide can reduce bacteria by 90% to 100%. This reduction in bacteria appears to be possible with a multiple-appointment protocol. Treatment success improves if obturation is delayed until the canal is free of bacteria; however, the significance of leaving some bacteria before obturation is unresolved.

Multiple appointment therapy should be considered in the following situations:

- asymptomatic nonvital teeth with periapical pathology and no sinus tract
- teeth with anatomic anomalies
- category 2 cases
- most retreatments
- patients with many allergies or previous flare-ups.

The prevention and elimination of apical periodontitis are the goals that define the discipline of endodontics. Once the clinician has determined how best to accomplish these goals, the decision of whether to provide treatment in a single visit or in multiple appointments will follow of itself. ♦

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**Question 4** Should antibiotics be prescribed when providing endodontic treatment? If so, what are the recommended drug regimens?

**Controlling Endodontic Infections**

Antibiotics are rarely necessary<sup>1</sup> and are often inappropriately prescribed for situations involving either a state of inflammation (e.g., pulpitis) or an infection with a site for drainage (e.g., sinus tract).<sup>2</sup> Instead, the most effective treatment for an endodontic infection is to access, debride and medicate the affected tooth to promote drainage, preparatory to disinfecting the root canal system (Figs. 1a to 1c; 2a to 2c). When the infection spreads beyond the roots, creating localized tissue swelling, an incision can be made to drain the area of infection and relieve pressure.<sup>3</sup> Antibiotics should be considered in the following situations:

- The patient is immunocompromised or in poor health.
- The infection is spreading and has become systemic.
- Swelling continues to spread despite attempts to disinfect the root canal system and establish drainage.



**Figure 1a:** Preoperative radiograph of tooth 21, which has been diagnosed with an acute periradicular abscess.

**Selecting an Antibiotic**

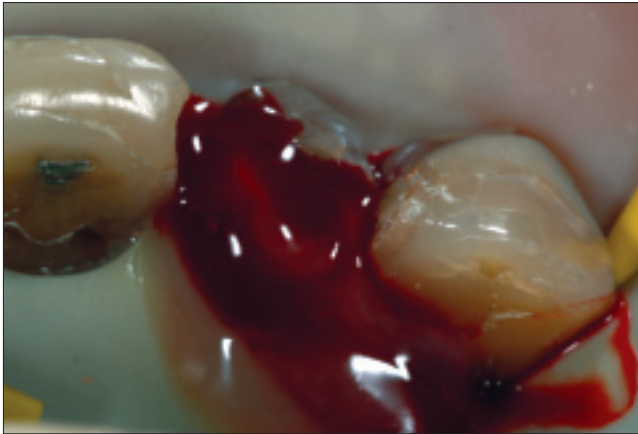
Various factors must be considered in selecting the best antibiotic, including the patient’s history of drug allergies and adverse reactions, the severity of the infection and the overall state of the patient’s health.<sup>4</sup>

Penicillin VK has a low cost and a narrow spectrum of bactericidal activity, has virtually no significant adverse effects in the absence of allergy (which is estimated at between 0.7% and 10% in the general population) and is efficacious against most of the bacteria associated with endodontic infections.<sup>4</sup> A recent survey found that this is the antibiotic of choice for odontogenic infections among members of the American Association of Endodontists (1-g loading dose followed by 500 mg 4 times a day for an average duration of about 1 week).<sup>2</sup> In Canada, this drug is available only in 150-mg or 300-mg capsules.

Amoxicillin has a broader spectrum of antimicrobial activity and is therefore suitable for treating immunocompromised patients with odontogenic infections.<sup>4</sup> Compared with penicillin VK, amoxicillin is more readily absorbed upon ingestion, has a longer half-life and sustains therapeutic blood levels for longer periods. As a result, doses of amoxicillin can be taken 3 times a day (1-g loading



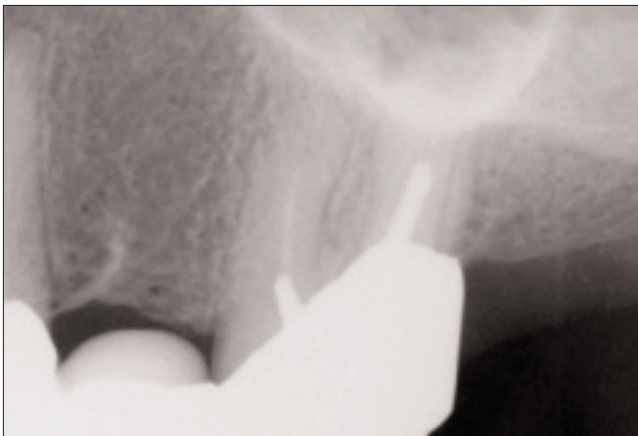
**Figure 1b:** The core material, prefabricated post and gutta-percha root filling material have been removed from the tooth.



**Figure 1c:** Considerable pus drained through the access opening. No antibiotics were necessary in the management of this case.



**Figure 2a:** Sinus tract draining through the palatal gingiva of tooth 26.



**Figure 2b:** The radiograph suggests the root canal system had been inadequately debrided and cleaned. Bacteria within the roots are contributing to the chronic radicular abscess. Endodontic retreatment will have to be performed and the canals chemo-mechanically debrided. Calcium hydroxide will be used as an intracanal medicament.



**Figure 2c:** Palatal gingiva at the time of obturation (2 weeks after endodontic retreatment). The soft tissue healed completely after debridement and disinfection of the canal system. No antibiotics were required in the treatment of this patient.

dose followed by 500 mg 3 times a day for 5 to 7 days).<sup>3</sup> However, for otherwise healthy individuals, the broader spectrum of activity of amoxicillin (relative to penicillin VK) may be more than is required and may contribute to the emergence of drug-resistant bacterial strains.

Clindamycin is suitable for patients who are allergic to penicillin, but it also has a broader spectrum of antimicrobial activity and is approximately 4–5 times more costly.<sup>2</sup> A loading dose of 300 mg is followed by 150 mg 4 times a day for 7 to 10 days.<sup>2,3</sup> The incidence of pseudomembranous colitis in association with this drug is estimated at only 1%.<sup>4</sup>

High rates of resistance to erythromycin among endodontic pathogens render this antibiotic obsolete for odontogenic infections.<sup>4</sup> Clarithromycin is a suitable alternative to erythromycin because it has better efficacy against oral anaerobic bacteria, is less likely to cause gastrointestinal problems and requires less frequent dosing (250–500 mg every 12 hours for 7 to 10 days).<sup>3,4</sup> ♦

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***Drs. Iwanowski, Munce, Thom and Teplitsky are members of the Canadian Academy of Endodontics.***

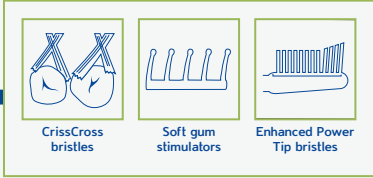
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# Clinical Showcase

*Clinical Showcase is a series of pictorial essays that focus on the technical art of clinical dentistry. The section features step-by-step case demonstrations of clinical problems encountered in dental practice. This month's article is by Dr. Glenn van As. If you would like to propose a case or recommend a clinician who could contribute to Clinical Showcase, contact editor-in-chief Dr. John O'Keefe at [jokeefe@cda-adc.ca](mailto:jokeefe@cda-adc.ca).*

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## Osseous Recontouring with the Er:YAG Laser to Obtain Ideal Biologic Width

Glenn van As, DMD

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General dentists often face difficult treatment decisions that involve full-coverage restorations for teeth that already have existing restorations of substantial size and depth. These pre-existing restorations may encroach upon the biologic width, and the practitioner may thus need to consider various options for placement of the final restoration margin. For example, the margin might be placed equigingivally or supragingivally on existing restorative materials; the final subgingival margin could be placed on solid tooth, thus infringing upon the biologic width; or the margin could be placed subgingivally on solid tooth structure in conjunction with surgical alteration of the biologic width to a more suitable amount.

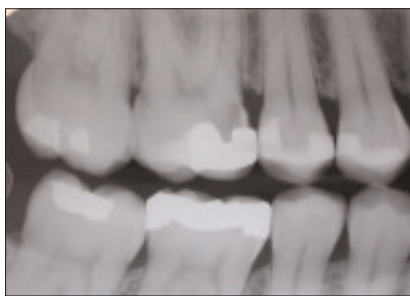
In the past, traditional treatment plans called for placement of a provisional crown and additional periodontal reduction of soft tissue and bone in the area encroaching on the biologic width. Sometimes, however, the need for additional periodontal surgery comes as a surprise to both the patient and the dentist, and the dentist may find it awkward to discuss the need for additional appointments or referral to a periodontist. In these situations, extra appointments may be required to restore the tooth to optimum function and the patient may incur additional cost for the treatment.

In such cases, the crown must be lengthened to achieve ideal biologic width and thus prevent the chronic inflammation that may occur with subgingival margin placement of the final restoration, which can be both unsightly and

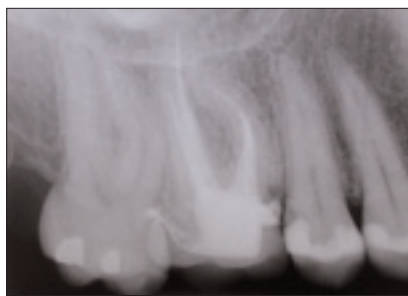
uncomfortable. Traditional methods of creating optimal biologic width have involved flap surgery in conjunction with removal of bone (osseous recontouring) to establish a minimal space of approximately 3 mm between the restorative margin and the bone.

More recently, hard-tissue lasers (Er:YAG [erbium yttrium aluminum garnet] and Er,Cr:YSGG [erbium and chromium yttrium scandium gallium garnet] wavelengths) have been developed to safely cut enamel, dentin, cementum and bone. Clinicians are also using these lasers as alternatives to handpieces for the removal of osseous tissue during the crown-lengthening phase. Lasers represent a reasonable alternative to traditional handpieces and perhaps offer additional benefits in terms of reduced bacterial contamination during surgery, increased visibility with reduced water splash, and similar or faster healing.

In some instances, the need for osseous recontouring is very localized and specific, perhaps on only one surface of a tooth. This limited need for recontouring may occur around deep subgingival restorations, when the caries is localized to one surface of a tooth or with subgingival cuspal fractures. In these cases the end-cutting hard-tissue lasers can be used for localized osseous removal without raising a flap. In allowing for careful removal of osseous tissue in a closed-flap situation, it is possible to generate an ideal biologic width for the final restoration and to complete the impressions for the indirect restoration all in the same appointment.



**Figure 1:** Bitewing radiograph showing large secondary carious lesion on mesial aspect of tooth 16.



**Figure 2:** Periapical radiograph showing completed endodontic treatment of tooth 16.



**Figure 3:** Tooth 16 before preparation for full-coverage porcelain-fused-to-metal crown.



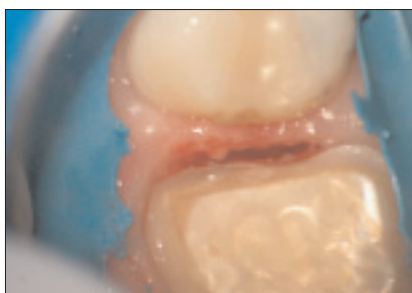
**Figure 4:** Crown preparation in progress; the mesial margin is still on the composite.



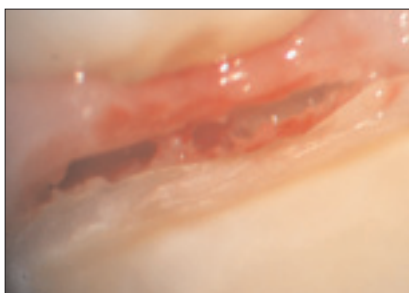
**Figure 5:** Probe indicates subgingival location of the mesial margin, which infringes on the biological width.



**Figure 6:** Osseous recontouring with Er:YAG laser (400 micron tip).



**Figure 7:** Osseous recontouring completed (setting for laser: 30 Hz, 100 mJ, with water).



**Figure 8:** High-magnification view of osseous recontouring site (16 $\times$ ).



**Figure 9:** With 3 mm of biological width restored, the soft-tissue laser is used for gingival troughing and coagulation.



**Figure 10:** High-magnification view of mesial aspect of tooth 16 once troughing is complete (16 $\times$ ).



**Figure 11:** Preparation of tooth 16 complete and ready for impression.



**Figure 12:** Low-magnification view of completed impression (10 $\times$ ).

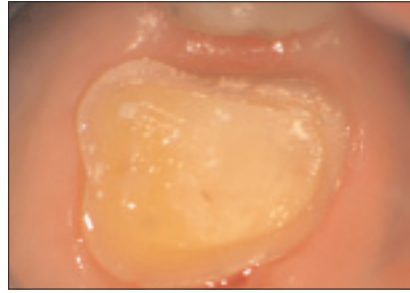
The author cautions clinicians to contemplate closed-flap osseous surgery only in cases where localized or minor osseous recontouring is necessary. Suitable sites for such surgery would include areas next to a pontic site or an extraction site, as well as the buccal or lingual surface of a tooth. High magnification imaging allows the clinician to see precisely the amount of bone to be removed. The clinician should use caution in performing closed-flap procedures if the patient has any pre-existing periodontal disease in other areas of the mouth.

The main difficulty with closed-flap osseous recontouring is reduced visualization of the interaction of the end-cutting laser with bone; furthermore, unwanted iatrogenic vertical

defects may be produced. For cases involving circumferential bone relief on one tooth, or if there are multiple teeth requiring treatment, the author recommends that use of the laser in a full open-flap surgical procedure be considered. The visibility afforded by full open-flap osseous surgery allows the clinician to visualize the parabolic architecture of the bone, prevent unwanted vertical defects, establish the ideal biologic width through creation of ledges or bone fragments, and maintain crucial amounts of attached keratinized tissue. However, once the clinician has performed open-flap surgery, there is a mandatory healing period of 8–12 weeks before final impressions of the preparation can be taken for the laboratory to fabricate the final restoration.



**Figure 13:** Occlusal view of provisional crown on tooth 16.



**Figure 14:** Low-magnification view of preparation following removal of provisional crown on tooth 16 (10x).



**Figure 15:** High-magnification view of the mesial aspect of tooth 16. Note the good periodontal healing (16x).



**Figure 16:** Mesial view of porcelain-fused-to-metal crown of tooth 16 on the die.



**Figure 17:** Occlusal view of the inserted crown.



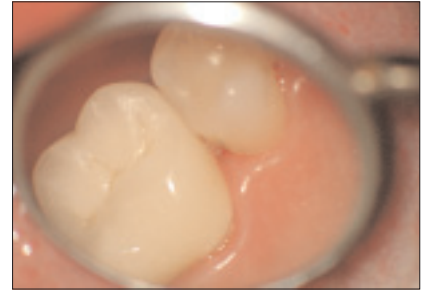
**Figure 18:** Labial view of crown inserted on tooth 16.



**Figure 19:** Occlusal view of crown 3 months after insertion.



**Figure 20:** Labial view of crown 3 months after insertion.



**Figure 21:** Mesial indirect view of crown 3 months after insertion.

In the case illustrated here, the clinician created an ideal biologic width for a single crown using an Er:YAG laser under high magnification (16x power with the dental operating microscope) in a closed-flap procedure performed on the same day that final impressions were taken for the restoration. Healing was ideal, and the patient was spared a long period of healing between the surgical and restorative phases of treatment. ♦

### Further Reading

To view the list of further reading, consult the electronic version of *JCDA* at <http://www.cda-adc.ca/jcda/vol-71/issue-1/53.html>.



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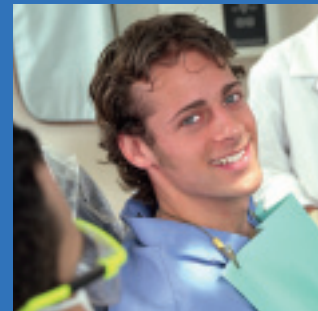


*Dr. van As is one of the presenters at the Academy of Laser Dentistry's 12th Annual Conference and Exhibition to be held in New Orleans, Louisiana, April 6-9, 2005.*

*Dr. van As receives an honorarium for lectures from Global Surgical Corp. (microscopes) ([www.globalsurgical.com](http://www.globalsurgical.com)) and Hoya Con Bio (lasers) ([www.conbio.com](http://www.conbio.com)) and has been on faculty for which he receives honorariums from the Institute for Laser Dentistry ([www.laserdentistry.ca](http://www.laserdentistry.ca)).*

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Shipping & handling charge	\$14	\$16	\$18	\$20	\$22	\$24	\$26	\$28	\$30	\$32

Check here for a sample pack (one copy of each title) for \$7.00, plus \$2.00 shipping and handling, and applicable taxes.

To avoid processing delay, please complete all pertinent questions. Please print.

Check one:  Dr.  Mr.  Mrs.  Miss  Ms.      Date \_\_\_\_\_

Name \_\_\_\_\_ Contact Name \_\_\_\_\_

Address \_\_\_\_\_ City \_\_\_\_\_

Province \_\_\_\_\_ Postal Code \_\_\_\_\_ Daytime telephone: (      ) \_\_\_\_\_

Fax: (      ) \_\_\_\_\_ E-mail address (please print): \_\_\_\_\_

Please select one payment method from the list below.

Cheque     Visa     MasterCard    Card No.                          Expiry Date

Cardholder's Name (please print) \_\_\_\_\_ Signature \_\_\_\_\_

A30

**Please return this form by mail to CDA D.I.S. Booklets, c/o CDSPI, 155 Lesmill Road, Toronto, Ontario M3B 2T8.**

Please allow 20 days from order date for mail delivery. Please add \$6 to the shipping and handling charge for rush delivery. For faster mail delivery please use credit card — credit card orders can be processed via phone or fax. For e-mail orders: Our order desk will contact you by phone for your credit card number. **Please do not e-mail credit card numbers.**

**Phone** 1-800-561-9401 (toll-free) or (416) 296-9401 ext. 5030 **Fax** 1-866-337-3389 (toll-free) or (416) 296-9299 **E-mail orders:** [affinity@cdspi.com](mailto:affinity@cdspi.com)

Orders paid by cheque will be shipped upon receipt of completed order form and cheque for the full amount. Please make cheques payable to CDSPI.

The CDA is grateful to Colgate-Palmolive for its generous sponsorship of the D.I.S. program.  
 The D.I.S. booklets are written by the CDA and produced and distributed by CDSPI.



\*TM Reg. Colgate-Palmolive Canada Inc.

# CDSPI Reports

## AN ADVISOR CAN HELP YOU MAKE THE MOST OF YOUR RRSP

By John Webster, CFP

As the RRSP contribution deadline approaches, is deciding where to put your RRSP money causing you some anxiety? Turning to a qualified financial advisor can help ease the decision-making.

### Selecting Appropriate Investments

In my experience, much of the confusion for investors is due to the sheer number of investments available, including over 5,000 mutual funds alone. Because financial professionals spend a great part of their day keeping up-to-date with the continual changes in the investment world, they are uniquely qualified to help you sort through these offerings and guide you to investments that are appropriate for your circumstances and retirement goals.

In fact, perhaps the greatest difference an advisor can make is assisting you in reaching *objective* decisions. Excited about a hot financial tip you've just learned about? Your advisor won't be. He or she will look at an investment's fundamentals, minus the emotion.

### Designing a Balanced Portfolio

Don't have a plan for how you'll reach your investment goals? It's never too late to develop one, even if you have an assortment of RRSPs all over the place. An advisor can show you where to place this year's contribution

to start creating balance in your investment portfolio.

It's been said that investment success is based primarily not on individual investments, but rather on how you allocate your portfolio among the different investment classes (cash, income and equity). With an advisor's help you can determine the right mixture of equity, fixed income and cash investments that are appropriate for your financial objectives and investment time frame, so you can reduce your portfolio's volatility and investment risk. Additionally, you can learn how to integrate non-registered investments into your overall asset mix and obtain advice about the potential tax implications of your non-RRSP investments.

### Implementing Strategies

Even if you are a do-it-yourself investor, you can benefit from professional advice. That's because after you've learned about all the general investment strategies out there, you'll want to find out how to tailor them to your individual circumstances.

As a dental professional, you have a unique opportunity to deal with a single financial advisor at Professional Guide Line Inc. who is familiar with all your investment planning needs. This can make your investment planning consultations more efficient — as you'll be speaking with a professional who will have an ongoing understanding of your specific situation. If you and your family already have a relationship with a specific representative, you can request that person be assigned to you. Think of your personal financial advisor as a personal trainer for your portfolio, who can help keep your investments in top form. Contact Professional Guide Line's Investment Services department at 1-877-293-9455, extension 5023, to have a financial advisor personally assigned to your account.\*

*John Webster is a certified financial planner and vice-president, Financial Planning for Professional Guide Line Inc. — A CDSPI Affiliate. For over 8 years, he has served exclusively the investment planning needs of dental professionals and their families.*

*\* Restrictions may apply to advisory services in certain jurisdictions.*

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Deborah Rodd  
c/o Canadian Medical Association  
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Tel.: 800 663-7336 or  
(613) 731-9331, ext 2127  
or 2314  
Fax: (613) 565-7488  
E-mail: [advertising@cma.ca](mailto:advertising@cma.ca)

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Issue	Closing Date
February	January 10
March	February 10

## Send all box number replies to:

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The names and addresses of advertisers using box numbers are held in strict confidence.

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Special Display (2 1/8" x 2 1/2") \$225.

All advertisements must be prepaid.

10% discount to CDA members.

## OFFICES & PRACTICES

**ALBERTA - Edmonton:** Location well-suited for periodontist, available beside established prosthodontist. Exceptionally located and attractive property offers 1,600 ft. of space for lease in brand new building. Prime exposure on street level in Edmonton, Alberta. Call (780) 420-1604 to enquire about this opportunity. D1622

**ALBERTA - Rimbey:** Opportunity to purchase practice or associate with transition to ownership in this family oriented, solo, rural practice. New graduates welcome. Owner willing to assist with transition. Excellent long-term staff. Practice grossing \$580,000/year on 4 days/week. Good leaseholds. Low overhead. One hour south of Edmonton. Priced reasonably. Contact: Anne, tel. (403) 843-2173. D1569

**ALBERTA - Edmonton:** Well-established, solo dental practice for sale, few blocks away from West Edmonton Mall; 3 operatories, very bright and beautiful office; 1200 active and pleasant patients. The present dentist is moving out of Edmonton, will help in transition. Tel. (780) 987-9198. D1495

**BRITISH COLUMBIA:** Prosthodontic practice for sale. Attractive, high-income (7-figure billings), modern, 3-operator office. Computerized office, digital x-ray, new panoramic machine. All facets of prosthodontics - fixed/removable, implants, cosmetic procedures. Hygienist on staff. Very desirable area. Independently appraised. Complete transition available (owner willing to stay on as an associate). Well-established referral base. E-mail [prosthodontist@hotmail.com](mailto:prosthodontist@hotmail.com). D1651

## Sunny North Okanagan, B.C.

### Modern - Cosmetic - Turn Key

Be your own Boss  
Great Team & Patients  
Large Patient Service Area  
Excellent Cash Flow

Purchase or associate with transition to purchase. Currently 3 ops (room for more), over 1700 active charts, strong new patient flow, great client variety, large market without competition and an unparalleled lifestyle. For more information, email: [drsmuir@sunwave.net](mailto:drsmuir@sunwave.net). ph: 250-309-3823

D1636

**BRITISH COLUMBIA - Castlegar:** Dentist wanted. Prime retail location, high exposure, custom-designed dental office. Includes leasehold improvements, parking. Attractive terms for dentist looking to build practice in beautiful area with great climate, downhill skiing, golf, lakes at your doorstep. Call Caroline, (250) 595-3142, (250) 727-0681. D1615

**BRITISH COLUMBIA - Victoria:** Exceptional family practice for sale in busy plaza location. Well-established practice with long lease. Gross a million +. Six operatories with modern equipment, computerized intraoral camera. High new-patient flow, approximately 2400 active patients. Exceptional opportunity for a progressive, professional. Principal will stay for transitional period if required. Please contact: Bob, fax (250) 475-3216 or e-mail [crluck2@shaw.ca](mailto:crluck2@shaw.ca). D1537

**NOVA SCOTIA - Halifax:** Exceptional opportunity in downtown Halifax. Modern well-established dental practice for sale. Prime location with great patients and staff, high new patient flow. Excellent leaseholds and high-tech equipment. Professional practice valuation available upon request. Gross \$700,000 + per year, on 4 days per week. Owner is relocating out of province. Contact: Peter, tel. (902) 497-6700 or check our Web site [www.scotiadental.com](http://www.scotiadental.com). D1634

**ONTARIO - Oshawa (east of Toronto):** Dental office for lease, established for 25 years. Four treatment rooms, reception, lab, storage, parking, pylon signage. High-traffic location. Growing area. \$2,300/month plus operating costs. Chris Tyrovolas, Associate Broker, Royal LePage, tel. (866) 273-1333, e-mail [ctyrovolas@royallepage.ca](mailto:ctyrovolas@royallepage.ca).

D1592

**QUEBEC - Montreal:** Practice for sale. Near the Metro (short walk). Multi-ethnic patients. Fax to (514) 342-0422 and we will call you back. Please provide your name, address, telephone and fax numbers.

D1629

**SASKATCHEWAN - Prince Albert:** For sale, 39-year-old, well-established, well-managed practice with 3,600 + active patients and excellent hygiene program in place. Completely computerized office with 5 operatories and oral camera. Grossing just under \$900,000 working 170 days/year. Situated in Prince Albert with low cost of living, reasonable indoor and outdoor amenities including 30 minutes away from cottage country. Dentist motivated to sell, staff poised to facilitate quick successful transition. Enquiries to: Box 2194, Prince Albert, SK S6V 6Z1; tel. (306) 764-8145 or fax (306) 922-9240.

D1627

## POSITIONS AVAILABLE

**ALBERTA - Fort McMurray:** Unique opportunity in booming Fort McMurray. Our friendly dental group is seeking an associate to join our team immediately. Looking for an experienced dentist or new graduate that can provide top-quality dental services. Offering the latest technology including laser dentistry. Interested applicants please call (780) 790-0889, fax (780) 790-7168 or e-mail [alina@altech.ab.ca](mailto:alina@altech.ab.ca).

D1638

**ALBERTA - St. Albert:** Full-time associate dentist needed to start late January 2005. Very busy, new, modern clinic with an abundance of new patients and emergencies. Over 50 new patients/month in a highly visible, easily accessi-

ble location. Beautiful community to raise a family. Excellent patient base with mid to upper incomes. Insurance coverages very good (mostly dual) thereby allowing you to practise excellent dentistry - crown and bridge, endodontic skills an asset. You'll have your own 3-chair space within our 7-chair clinic. Prefer 1-2 years experience, but will consider new graduates. Tel. (780) 458-7040 or fax resume to (780) 458-6669.

D1630

**ALBERTA - Northwest Calgary:** Associate, June 1, 2005. Excellent opportunity for dynamic, experienced family dentist. Full-time position with 2 evenings per week and every second Saturday. Large existing practice with 30-40 new patients/month. Fax (403) 259-2622 or e-mail [Ejtamm@aol.com](mailto:Ejtamm@aol.com).

D1632

**ALBERTA - Milk River:** Dentist required to establish practice in Milk River. Modern, renovated facility is available for lease and prepared for immediate dental practice occupation. Large space can accommodate practices ranging from small scale to state of the art. Dental services are in high demand for clientele from southern Alberta and northern Montana. For information on this exciting opportunity, please contact the Town of Milk River, tel. (403) 647-3773, fax: (403) 647-3772, e-mail [main@milkriver.ca](mailto:main@milkriver.ca).

D1635

**ALBERTA - Calgary:** Associate required, full time, for office in trendy high-traffic location beside a Starbucks. Special opportunity. E-mail [info@universitydentalcare.net](mailto:info@universitydentalcare.net), tel. (403) 262-1581.

D1644

**ALBERTA - Edmonton:** Associate needed for busy, 4-5 day/week position. Excellent opportunity with great staff in a well-established office. E-mail [drh@drherchen.com](mailto:drh@drherchen.com), fax (780) 989-9649, tel. (780) 477-6649.

D1652

**ALBERTA - Lloydminster:** Associate position available Feb. 1, 2005, in very busy 2-dentist practice. Averaging 80 new patients a month. Willing to transfer many of the current patient base (6,000 patients) to new dentist. Excel-

lent staff, excellent patients. Call Craig, (780) 875-4222.

D1613

**ALBERTA - Slave Lake:** Full-time associate required for a busy practice. Well-established office with six operatories. Excellent opportunity for new graduates or experienced dentist. Please contact: Jose Antony, Office Manager, tel. (780) 849-4477 or fax resume to (780) 849-6332.

D1621

**ALBERTA - Edmonton:** Associate opportunity, Today's Dental - [www.todaysdental.ab.ca](http://www.todaysdental.ab.ca). We are a modern, progressive clinic, situated in west Edmonton, in a very prominent location. We have a large existing patient base and a very healthy new patient flow. We invite a progressive dentist to join our team. We are looking for an ambitious, self-directed leader with strong interpersonal and communication skills, who is interested in possibly an equity position in the future. We are a fee-for-service office that delivers high-quality care, including LVI-trained neuromuscular esthetic dentistry, Cerec and laser therapy. Our entire team is dedicated to continuing education. This is a highly rewarding and well-compensated opportunity. We are committed to excellence and impeccable customer service, with a team that is excited about dentistry. If you want to be part of our team, please e-mail [smile\\_doc@shaw.ca](mailto:smile_doc@shaw.ca) or fax CV to (780) 486-7328.

D1602

**ALBERTA - Cold Lake:** Our well-established family practice is currently looking for an associate to join our friendly team of professionals. We are looking for a compassionate, motivated dentist with excellent communication skills to assume existing patients as the owner gears down for retirement. There is an opportunity for the right individual to buy all or part of this outstanding practice. We have a successful accelerated perio-hygiene department complete with intraoral cameras. You will enjoy providing all aspects of general dentistry in a busy, progressive, computerized family office. If you are looking for a rewarding and satisfying career with a team committed to providing exceptional dental health, please give us a call! We are located just 3 hours northeast of Edmon-

ton. You can enjoy a quality lifestyle in this beautiful lakeside city. For further information, contact: Kelly Avery, tel. (780) 594-5984 or fax your resume to (780) 594-5965. D1581

**ALBERTA:** Well-established Alberta practice, located 2 hours from Edmonton, requires full-time associate dentist. Rapidly growing family practice (50-80 new patients per month) located in new building. Please fax resume in confidence to (780) 872-7334. D1590

**ALBERTA - High Prairie:** Caring, enthusiastic and hard-working associate needed immediately for a very busy general practice. Emphasis on oral surgery and implants. Be as busy as you want to be and enjoy the outdoors. Only 4 hours from Edmonton. Suits new graduate or experienced practitioner. Locums on a regular basis welcome. Fax resume to (780) 523-4434. D1555

**ALBERTA - Peace River Region:** Associateship available for new graduate or experienced dentist. All phases of den-

tristry. Current practitioner and hygienist booked until March 2005. Practice is not currently accepting new patients despite constant demand. Set your own hours. Rural lifestyle offers many rewards. Low cost of living, excellent outdoor pursuits throughout region and full-service community only an hour away. Clinic in association with hospital, 3 physicians and visiting optometrist. Tel. (780) 524-3864, fax (780) 524-2299, e-mail [fishdoc@telusplanet.net](mailto:fishdoc@telusplanet.net). D1575


**ALBERTA - Rural:** Help! Associate required as full-time partner is leaving practice to pursue non-dental interests. Step in and assume full patient load. Young, energetic staff. Relaxed atmosphere. Family-oriented practice. New graduates welcome and buy-in for the right individual. Only 2 hours from Edmonton. Full or part-time applicants welcome. Contact: Neil, tel. (780) 484-5868. D1487

**BRITISH COLUMBIA - Kelowna:** Outstanding opportunity for a warm, caring associate to join an established

practice. Long-term staff and exceptional patients. Recent major renovations. New Adec equipment. Six operatories. Opportunity to buy into the practice. Reply to: Dental Associate, PO Box 694, Kelowna, BC V1Y 7P4. D1628

**BRITISH COLUMBIA - Grand Forks:** Associate with desire to purchase half of my busy general practice required for 4 days per week. Position starting Jan. 1, 2005. Please contact: Dr. Tracy Tambosso, tel. (250) 442-2731. D1631

**BRITISH COLUMBIA - Sparwood:** Full-time associate for busy, modern practice with a current associate patient base of 1500 +, 95% with insurance coverage. High income potential! Full use of 2 operatories in a 7-operator practice. Two hygienists, 6 CDAs. Sparwood is located in beautiful South East British Columbia with year-round recreation. Twenty-five minutes to Fernie, world-class ski resort, 2.5 hours to Calgary. Please tel. (250) 425-7081. Fax resumes to (250) 425-0532. E-mail information to [rschow@telus.net](mailto:rschow@telus.net). D1640



**Queensland Government  
Queensland Health**

**Oral Health**

**Dentist - Oral Health Services, Townsville, Townsville Health Service District, Queensland, Australia.** Remuneration value up to A\$88 381 p.a., comprising salary between A\$65 602 - \$77 462 p.a., employer contribution to superannuation (up to 12.75%) and annual leave loading (17.5%) (DO1 - DO7) VRN: TV41146. **Duties/Abilities:** Provide dentist general practitioner oral health services to eligible clients at any oral health facility in the Townsville Health Service District. Support the state wide delivery of oral health services and the achievements of targets in oral health treatment and promote prevention of oral illness. Potential applicants are advised that the *Commission for Children and Young People Act (2000)* requires Queensland Health to seek a 'working with children check' from the Commission for Children and Young People prior to appointment to this position.


**Enquiries:** Dr David Boucher +61 7 3231 3743.

**Application Kit:** +61 7 4796 1709 or email: [TSV\\_Recruitment@health.qld.gov.au](mailto:TSV_Recruitment@health.qld.gov.au)

**Closing Date:** 5.00 p.m. Monday, 31 January 2005

*A non-smoking policy is effective in Queensland Government buildings, offices and motor vehicles.*

D1633  
TMP 030460



**GOVERNMENT OF NUNAVUT  
REQUEST FOR PROPOSAL**

Department of Health and Social Services,  
Hon. Levinia Brown, Minister

**Dental Services - Kivalliq Region  
RFP # HSS 177796-050112**

Proposals addressed to: Department of Health and Social Services, Government of Nunavut Attention: Contract Administrator, Jane Pelley, P.O. Box 1000, Station 1000 Iqaluit, Nunavut XOA OHO (or Delivered to the third floor Sivummut Building # 1107 Iqaluit) will be received until:

**3:00 p.m., LOCAL TIME, Friday, February 18, 2005**

**For the purposes of this proposal call the provisions of the (NNI) Nunavummi Nangminiaqqtunik Ikajuuti Policy apply. All or any of the proposals not necessarily accepted.**

Vendors may obtain the Request for Proposal for the Dental Services – Kivalliq region package starting January 17th, 2005 from the address below

Proposal Enquiries to: Jane Pelley  
Health and Social Services  
Government of Nunavut  
Phone: (867) 975-5737  
Fax: (867) 975-5799  
Email: [jpelley@gov.nu.ca](mailto:jpelley@gov.nu.ca)

D1648

**BRITISH COLUMBIA - Vancouver:** Orthodontist or GP limited to orthodontics. Downtown Vancouver on waterfront serving 15 GP dentists in multi-location (6), cosmetically oriented group. We are very flexible with schedule (part time or full time) and remuneration; 3-7 chairs available, state-of-the-art practices (digital everything). Please contact: Dr. Armstrong, tel. (604) 683-5530, e-mail [aarm@axion.net](mailto:aarm@axion.net). Web site [www.aarm-dental.com](http://www.aarm-dental.com). D1645

**BRITISH COLUMBIA - Vancouver:** Endodontist or GP limited to endodontics. Downtown Vancouver on waterfront required to take over for our endodontist. Three-day endodontic practice serving multi-location (6) Vancouver group practice (15 GPs). State-of-the-art endodontic technologies including microscope. Flexible schedule (could be full time) and remuneration. Please contact: Dr. Armstrong or Dr. Thom, tel. (604) 683-5530, e-mail [aarm@axion.net](mailto:aarm@axion.net). Web site [www.aarm-dental.com](http://www.aarm-dental.com). D1646

**BRITISH COLUMBIA - Williams Lake:** Full-time associate opportunity available for July 2005. Established associate position with excellent earnings track record going back 25 years. Large family practice with well-organized hygiene department and computerized office support. Williams Lake is a small city in the interior of British Columbia. It is a great family town with mountain biking, skiing, golfing, hiking, etc., all close by. This is an opportunity to enjoy small town living and make a good income. Please call Dr. Allistair Menzies or Dr. Perry Vitoratos collect, (250) 398-7161 (days), (250) 398-2615 or (250) 398-9085 (evgs.), e-mail [vitoratos@shaw.ca](mailto:vitoratos@shaw.ca), fax (250) 398-8633. D1620

**BRITISH COLUMBIA - Kamloops:** Associate required for a busy general practice. Wide range of dentistry and a wonderful staff. Buy-in an option for the right candidate. Interested applicants please call (250) 374-4544 or e-mail [abtucker@telus.net](mailto:abtucker@telus.net). D1596

**BRITISH COLUMBIA - Chilliwack:** Full-time associate position available to

dentist committed to continuing education/excellence in patient care. Area offers year-round recreation including skiing, boating, hiking, etc., 100 km east of Vancouver, mild climate. Present associate has busy practice and is leaving the area. There is potential for partnership. Reply to: Dr. Michael Thomas, 102-45625 Hodgins Ave., Chilliwack, BC V2P 1P2; tel. (604) 795-9818 (res.), (604) 792-0021 (bus.). D1553

**BRITISH COLUMBIA - Invermere on the Lake:** Lifestyle in paradise! Ski in the winter at Panorama Mountain Village and enjoy the lake in the summer. Full-time associate required, ultimately leading to partnership. Well-established family practice in a newly built office at a thriving resort town. Promising opportunity for right individual. Tel. (250) 342-0776, e-mail [rskanan@telus.net](mailto:rskanan@telus.net). D1561

**BRITISH COLUMBIA - Nanaimo:** Associate wanted for extremely busy and established dental practice. May lead to long-term commitment (buy in) for the right person. Join a wonderful office with long-term committed staff members. Enjoy the enviable lifestyle that Vancouver Island has to offer. Please call Dr. Lynn Lueke, Dr. Patricia Crosson, (250) 754-1949. D1541

**BRITISH COLUMBIA - Vancouver:** Specialist periodontal practice in prime Vancouver location seeks a periodontist to associate with our progressive growing group. We emphasize ideal periodontal, dental implant, prosthetic and esthetic treatment. Close to ocean, mountains and Whistler. Long-term association for the right person. Fax resume to (604) 913-1610. D1577

**MANITOBA - Winnipeg:** We are seeking a motivated quality-minded dentist to join our progressive, well-established family practice. We are situated in one of the most affluent areas of the city and have recently moved to a brand-new, state-of-the-art facility. There is unlimited potential for the right individual to practise high-quality dentistry in comfortable, relaxed surroundings. A special interest in pedo,

perio or oral surgery would complement the principal. Please contact: Dr. Ron Tough, tel. (204) 253-1834 (evgs.), fax (204) 256-8381. D1637

**MANITOBA - The Pas:** Looking to be more busy or for a change? Come work for us in a busy general practice clinic where you can be as busy or relaxed as you want. We pay a high guaranteed commission on top of your regular percentage. Your accommodation and travel are reimbursed as well. Work full time or in terms with extended holidays. Flexibility, high net income and best of all no hassles. Call for details, (204) 623-1494 or fax resume to (204) 623-6162. D1647

**MANITOBA - Winnipeg:** Full- or part-time associate position available for established dental practice. Please fax resume to (204) 897-6964 (before 5 p.m. - Central Standard Time). D1618

**MANITOBA - Killarney:** Full-time associate to replace long-term associate leaving January 2005. To join one dentist and two hygienists in this extremely busy office and work in a relaxed atmosphere with great support staff, very competitive remuneration and full schedule from day one. Killarney, a lakeside resort town, population 2,500 and drawing area of about 7,000, is 1 hour south of Brandon and 2 hours from Winnipeg. For a great family life and outdoor lifestyle, fax resume (204) 523-8670, tel. (204) 523-4601. D1625

**MANITOBA - Winnipeg:** We are seeking a compassionate, hard-working associate who has good leadership skills and a commitment and ability to provide excellence in dental care. Oral surgery experience required. We offer a terrific working environment in our modern office with an exceptional support staff and strong preventive program. Buy-in for the right individual. Call Dr. Brad Stevens, (204) 257-1891, fax CV to (204) 255-9564. D1626

**NORTHWEST TERRITORIES - Inuvik:** Replacement for 3 weeks. Looking for a dentist from Mar. 21 to Apr. 8, 2005. Other dates also available. Sched-

ule already booked, excellent remuneration, accommodations included. Come experience the far North. Please contact: Nancy or Lynda, tel. (867) 777-3008 or e-mail [alexandre.vial-nadeau@hec.ca](mailto:alexandre.vial-nadeau@hec.ca).

D1650

**NORTHWEST TERRITORIES - Yellowknife:** Associate needed to join an established, very busy, modern dental clinic (6 dentists) in a thriving community - the diamond capital of North America. The clinic offers all modern equipment including intraoral cameras, abrasion units, etc., with an excellent and friendly support staff, providing very high-quality dentistry, with the emphasis on quality rather than quantity. This is an excellent opportunity for anyone wishing to enjoy a wonderful lifestyle whilst practising dentistry at its best. Please send resume to: Administration, PO Box 1118, Yellowknife, NT X1A 2N8; tel. (867) 873-6940, fax (867) 873-6941.

D1159

**NOVA SCOTIA - Halifax:** Associate required for a busy family practice. Please fax resume to (902) 443-5614 or e-mail [dentalstaff@hotmail.com](mailto:dentalstaff@hotmail.com).

D1542

**NOVA SCOTIA - South Shore:** Join Dr. Kim Mailman (Dalhousie 1984) and his excellent team in the seaside town of Shelburne. Only 2 hours from Halifax, Shelburne has the most desirable microclimate in Nova Scotia, adjacent to one of the world's best natural harbours. This full-time associateship has future buy-in potential in an extremely busy office. Practise all aspects of dentistry and enjoy the relaxed lifestyle of the beautiful south shore of Nova Scotia. Tel. (902) 875-4441.

D1534

**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

## A large medical company is looking for dentists to work in Kuwait.

The following are needed:

### Orthodontist, Prosthodontist Pedodontist, Periodontist Endodontist and General Dentists

CONDITIONS:

Minimum 5 years of clinical experience is required

Fluent in English (speaking and writing)

Please forward your CV and a copy of your transcript and degrees to:

**Fax 011 965 5759043**

**E-mail [asadeqdds@yahoo.com](mailto:asadeqdds@yahoo.com)**

D1642



## 'NAMGIS DENTAL CLINIC

(Alert Bay, British Columbia)

is seeking a

## Dentist

We are seeking a highly motivated dentist to operate our modern three-operatory dental clinic. The 'Namgis Dental Clinic serves the residents of Alert Bay and other northern-Vancouver Island communities. The successful candidate will provide a full range of treatment services. An attractive compensation package with a combination of salary and shared billings, plus no overhead, make this an excellent opportunity for someone seeking the rewards and challenges of dentistry without the usual financial stress.

The community of Alert Bay is located in Johnstone Strait, off the northeast tip of Vancouver Island. We offer some of the world's best fishing, whale watching, kayaking, and other outdoor pursuits. The community is also a growing centre for Aboriginal artistic expression in all forms including carving, dance, and other traditions. For more information on the community, please visit our website at [www.namgis.org](http://www.namgis.org)

For more information on the position, please contact:

Ian Knipe, Administrator

P.O. Box 290, Alert Bay, B.C. V0N 1A0

ph: (250) 974-5522, fax: (250) 974-2736 e-mail: [IanK@namgis.bc.ca](mailto:IanK@namgis.bc.ca)

D1598

**ONTARIO - Amherstburg/Windsor Area:** Full-time dentist wanted to associate in our busy, well-established dental practice in Amherstburg, Ontario. Our office is just a 20-minute drive from Windsor. Presently retain over 6,000 active charts and growing. Looking for a kind, active, professional and highly motivated individual. Offering up to 50% compensation. Excellent opportunity for any associate willing to commit themselves to long-term relationship and future growth in this wonderful community. Tel. (519) 980-4073. D1639

**ONTARIO - West of Toronto:** Full-time associate position in a well-established practice, replacing associate who is returning to school for graduate studies. Your schedule will be booked from day 1 and you will have the opportunity to be exposed to all aspects of dentistry such as cosmetics, implants and much more as we have a team of specialists working alongside of us! If you are a team player and are looking for a positive working environment, fax to (905) 846-5593. D1641

**ONTARIO - Kitchener area:** Opportunity Notice for a contract dentist for Grand Valley Institution. Correctional Service Canada, Ontario Region, requires a dentist to be contracted with through an open bidding tender process to provide dental services to the Grand Valley Institution for Women, which is located near Kitchener, Ontario. This tendered contract position will start Feb. 1, 2005 for a 1-year contract with up to 4 option years to be renewed yearly upon mutual consent of both parties. Free information on this opportunity and a Request for Proposal package that can be downloaded for a fee is available on the MERX Government Electronic Tendering System Web site at [WWW.MERX.COM](http://WWW.MERX.COM), re: Dentist opportunity notice # 105522 or by calling the call centre at (800) 964-6379, e-mail to: [service@merx.com](mailto:service@merx.com) or fax (888) 235-5800. The deadline for submission of a proposal to Correctional Service Canada for this opportunity posting is Jan. 21, 2005 at 2 p.m. EST. Proposals must be mailed or couriered to Correctional Service Canada. The Request for Proposal package, downloaded for a fee, contains all the mandatory requirements

for an institutional dentist, the scope of work/services to be performed for the contracted position, the payment terms section to be filled out by the dentist and instructions on how to apply for this opportunity. For more information please contact: Geoff Hinch, Acting Contract Administrator, tel. (613) 530-3167 or e-mail [HinchGA@csc-scc.gc.ca](mailto:HinchGA@csc-scc.gc.ca). D1643

**ONTARIO - Ottawa (Central East):** Unique opportunity for 2-3 month associateship leading into buying 30% of a \$1.4 million, 6-operator solo practice. Over 3,500 active charts. Positive, hard-working, goal-oriented dentist with a passion for dentistry required. Tel. (613) 282-5331. D1649

**ONTARIO - Central Niagara Region:** We are seeking an associate dentist for a family-oriented, well-established practice in the Niagara Peninsula. We offer excellent support staff and hygiene program, in a newly renovated location. Position is either full or part time. Please fax your resume to the attention of the office manager, (905) 734-9878. D1591

**ONTARIO - Brockville and Morrisburg:** Experienced associate required for 1 of 2 well-established, busy practices. Enjoy a small-town atmosphere and the scenic beauty of the 1000 Islands region with easy access to large city centres. Only 30 minutes to Kingston and 60 minutes to Ottawa. For more information contact: Dr. George Christodoulou, Altima Dental Canada, tel. (416) 785-1828, ext. 201, e-mail [drgeorge@altima.ca](mailto:drgeorge@altima.ca). D1269

**QUEBEC - Eastern Townships:** Windsor, near Sherbrooke. We are giving an associate the opportunity to become part of a mature and fully competent team. Pleasant and motivating work atmosphere. Please fax resume to (819) 845-7854. Tel. Dr. Jacques Vaillancourt, (819) 845-3080. D1371

**SASKATCHEWAN - Regina:** General dentistry practice position offered with North Regina Medical and Dental Clinic. Excellent earning capacity and opportunity for associate to establish prac-

tice in the city of Regina without any financial risk. Excellent terms. For details contact: Dr. Ronald Katz, tel. (306) 924-1494, fax (306) 585-5833, e-mail [rkatzclinic@accesscomm.ca](mailto:rkatzclinic@accesscomm.ca). D1600

**YUKON TERRITORY - Whitehorse:** Come for the beauty - mountains, lakes and rivers. Or come for the opportunity to practise dentistry where you are appreciated and well compensated. Have a look at our Web site [www.klondike-dental.com](http://www.klondike-dental.com). Tel. (867) 668-4618, fax (867) 667-4944. D1422

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D1611

**TEXAS - Dallas:** Growing dental company in and around Dallas is seeking full-time associates. Must be licensed or qualified to be licensed in Texas. Highest compensation package in the state; earn \$200,000 - \$400,000. Company to handle all immigration matters. Please call (630) 788-7167. D1513

**VERMONT, US - Burlington:** Beautiful Burlington, Vermont, is calling you! Established practice is seeking a dentist for a Monday through Friday work week. Full-time compensation includes: competitive salary, bonus potential and a full benefits package (including a 401K plan with matching funds). Part-time candidates will be considered. Positions also available in other states. For a position with a future call Brian Whitley, (800) 313-3863, ext. 2290 or e-mail [bwhitley@affordablecare.com](mailto:bwhitley@affordablecare.com). D1604

**VERMONT, US:** Dentists and oral surgeons. Opportunities for general dentists in Rutland, Montpelier and Lake Champlain areas. Openings available for employment, private practice and practice



acquisitions. Enjoy the splendor of the Green Mountains and Lake Champlain, all part of the unbeatable Vermont lifestyle. Contact: Lynn Harris, tel. (800) 288-1730, fax (518) 266-9289, e-mail [lynnharris@harrisbrand.com](mailto:lynnharris@harrisbrand.com).

D1538

**SAIPAN - COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS:** "Opportunity to live and work in paradise". Learn to scuba dive, wind surf and snorkel. Excellent location for children. Great private schools at affordable rates. Lower tax rates than Canada and U.S. Pay is in U.S. currency. Year-round climate of 78 to 85 degrees Fahrenheit. Laid-back island lifestyle. We are looking for an associate general dentist who has excellent chair-side manners, works well with families and children. Must be able to work with diverse cultures. Three years minimal experience. Must possess good endo, crown and bridge skills. Willing to see a minimum of 8 to 12 patients per day. New 4-operator clinic with state-of-the-art equipment and fully computerized. After first year, potential partnership or profit sharing available. Full benefits and paid vacation included in package. Contact: Scot Thompson, Clinic Manager, PMB 807, PO Box 10001, Saipan, MP 96950; tel. (670) 233-1100, (670) 235-4577 (res.), fax (670) 233-2233, e-mail [dentalcare@saipan.com](mailto:dentalcare@saipan.com) or [rod.stewart@saipan.com](mailto:rod.stewart@saipan.com). Must send last three employer references. D1605

# Delivering Excellence Throughout the World

No matter where the setting or the location, assistants enhance the delivery of quality dental health care and are critical members of the dental team. The role of dental assistants has evolved over the years, with assistants now involved with many aspects of a dental practice.



**March 6-12, 2005**

has been designated by the Canadian Dental Assistants' Association along with the Canadian Dental Association, the American Dental Assistants Association and the American Dental Association as the perfect time to acknowledge and recognize the versatile, multitalented member of your dental team – your Dental Assistant.



This message is promoted by the Canadian Dental Assistants Association, the Canadian Dental Association, Ottawa, Ontario and the American Dental Association's Council on Dental Practice in cooperation with the American Dental Assistants Association, Chicago, IL.

# CDA Funds

## CHECK OUT OUR PERFORMANCE

- ✓ Superior Long-Term Returns
- ✓ Leading Fund Managers
- ✓ Low Fees

CDA Funds can be used in your CDA RSP, CDA RIF, CDA Investment Account and CDA RESP.

### CDA Fund Performance (for period ending November 30, 2004)

	MER	1 year	3 years	5 years	10 years
<b>CDA CANADIAN GROWTH FUNDS</b>					
Aggressive Equity fund (Altamira)	up to 1.00%	9.4%	16.0%	11.0%	9.9%
Common Stock fund (Altamira)	up to 0.99%	14.9%	4.2%	3.9%	7.5%
Canadian Equity fund (Trimark) <sup>†1</sup>	up to 1.65%	11.3%	6.3%	7.3%	8.8%
Special Equity fund (KBSH) <sup>†2</sup>	up to 1.45%	11.2%	5.8%	-1.5%	15.5%
TSX Composite Index fund (BGI) <sup>††</sup>	up to 0.67%	16.2%	8.0%	4.8%	9.5%
<b>CDA INTERNATIONAL GROWTH FUNDS</b>					
Emerging Markets fund (KBSH)	up to 1.45%	3.1%	10.0%	4.2%	n/a
European fund (KBSH)	up to 1.45%	-5.4%	-13.6%	-10.5%	n/a
International Equity fund (KBSH)	up to 1.45%	-3.5%	-8.1%	-10.9%	n/a
Pacific Basin fund (KBSH)	up to 1.45%	-2.0%	-4.3%	-20.5%	n/a
US Equity fund (KBSH) <sup>†3</sup>	up to 1.20%	-3.2%	-12.6%	-7.4%	9.2%
Global fund (Trimark) <sup>†4</sup>	up to 1.65%	2.4%	2.0%	5.7%	9.8%
Global Stock fund (Templeton) <sup>†5</sup>	up to 1.77%	8.7%	-1.5%	-0.9%	n/a
S&P 500 Index fund (BGI) <sup>††</sup>	up to 0.67%	1.9%	-7.0%	-6.6%	9.6%
<b>CDA INCOME FUNDS</b>					
Bond and Mortgage fund (Fiera)	up to 0.99%	6.0%	5.4%	6.4%	7.2%
Fixed Income fund (McLean Budden) <sup>†6</sup>	up to 0.97%	6.8%	5.7%	7.0%	8.4%
<b>CDA CASH AND EQUIVALENT FUND</b>					
Money Market fund (Fiera)	up to 0.67%	1.7%	2.0%	3.1%	3.8%
<b>CDA GROWTH AND INCOME FUNDS</b>					
Balanced fund (KBSH)	up to 1.00%	6.8%	1.4%	1.9%	7.5%
Balanced Value fund (McLean Budden) <sup>†7</sup>	up to 0.95%	10.3%	5.6%	7.0%	9.7%

CDA 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. The annual MERs (Management Expense Ratios) depend on the value of the assets in the given funds. MERs shown are maximum.

† Returns shown are those for the following funds in which CDA funds invest: <sup>1</sup>Trimark Canadian Fund, <sup>2</sup>KBSH Special Equity Fund, <sup>3</sup>KBSH US Equity Fund, <sup>4</sup>Trimark Fund, <sup>5</sup>Templeton Global Stock Trust Fund, <sup>6</sup>McLean Budden Fixed Income Fund, <sup>7</sup>McLean Budden Balanced Value Fund.

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

For current unit values and GIC rates call CDSPI toll-free at 1-800-561-9401, ext. 5024 or visit the CDSPI Web site at [www.cdspi.com/funds](http://www.cdspi.com/funds).





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**Advanced practice management solutions**

New! ITRANS™ is the leading-edge Internet claims transmission and messaging service that boosts your front office efficiencies and brings powerful new capabilities, such as radiograph transmissions, online consultation and e-commerce to your practice.

Access to ITRANS is free to CDA members; non-members will pay an annual fee currently set at \$360, plus GST.

**Winning national advocacy on your behalf**

Successful lobbying for tax deductions for unincorporated self-employed Canadians protects over \$7,300 of potentially lost fee income annually and makes oral health care affordable and accessible to over a million more Canadians.

Even at a modest 30% profit margin, this single initiative puts up to \$2,190 on your bottom line, every year. See other valuable benefits in the table below.

**ANNUAL REALIZATIONS FOR SELECT CDA MEMBERSHIP BENEFITS**

<b>Benefit</b>	<b>Potential Value</b>	<b>Assumption**</b>	<b>Annual Benefit Realized</b>
CDAnet™	\$ 1,200	70% realized	\$ 840
ITRANS™	\$ 1,360	5% realized***	\$ 68
Increase in RRSP limits	\$ 1,980	100% realized	\$ 1,980
FDI World Dental Federation membership	\$ 65	100% realized	\$ 65
Increased traffic flow through public education	\$ 990*	100% realized	\$ 990
Tax deduction for unincorporated self-employed	up to \$ 2,190*	50% realized	\$ 1,095
Amalgam waste management	\$ 2,500	50% realized	\$ 1,250
Non-taxing of dental benefits	\$ 4,410*	100% realized	\$ 4,410
CDA insurance and investment plans	\$ 1,210	50% realized	\$ 605
<b>Total Benefit</b>	<b>\$ 15,905</b>		<b>\$ 11,303</b>

\* Potential values calculated using a modest 30% profit margin.

\*\* Each of the benefits outlined above is different in nature and may not be realized fully by all dentists. Those not fully applicable to all have been reduced accordingly to calculate an overall average.

\*\*\* Small level of realization based on a program still in its start-up phase.

This table prepared for the Canadian Dental Association by an independent consultant.

For more details about the benefits of CDA membership, visit our Web site at [www.cda-adc.ca](http://www.cda-adc.ca). Or call us toll free at 1-800-267-6354.



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