JOURNAL OF THE CANADIAN DENTAL ASSOCIATION

JCDA

September 2008, Vol. 74, No. 7

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JOURNAL OF THE CANADIAN DENTAL ASSOCIATION

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CANADIAN DENTAL ASSOCIATION

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September 2008, Vol. 74, No. 7

Mission Statement

The Canadian Dental Association is the national voice for dentistry, dedicated to the advancement and leadership of a unified profession and to the promotion of optimal oral health, an essential component of general health.

Cover photo: Owen Egan

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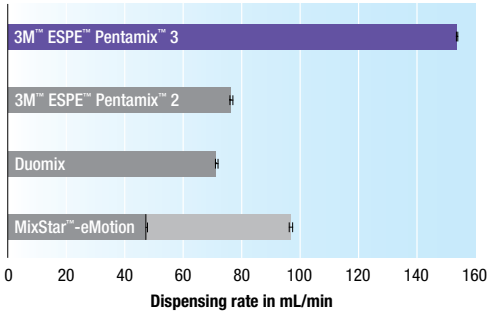

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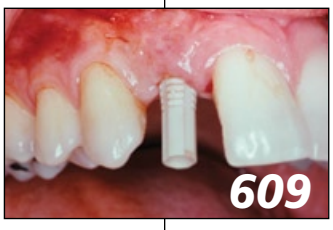

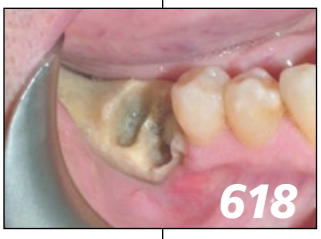

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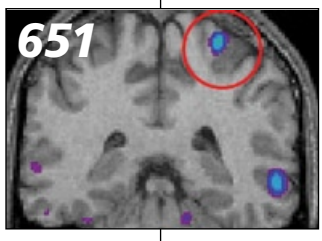

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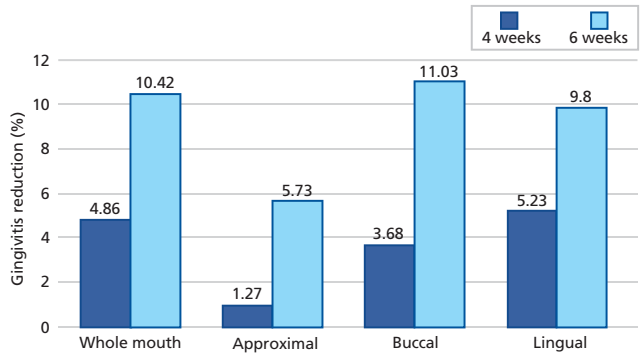

REMOVES HARD-TO-REACH PLAQUE[3,4]

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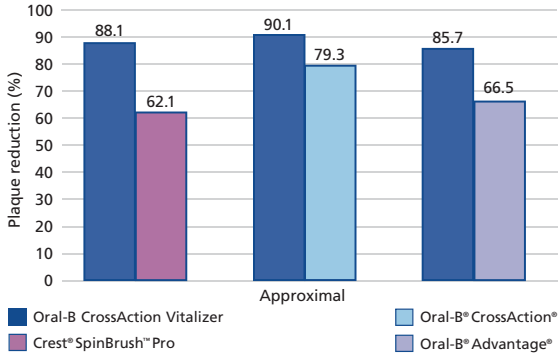

†vs. a regular manual brush.

References: 1. Data on file, P&G; based on one-time brushing studies. **2.** Data on file, P&G. **3.** Sharma NC, *et al.*, Am J Dent 2005;18:3-7 **4.** Sharma NC, *et al.*, J Dent Res 2003;82: Abstr.1392

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Dr. James Lund

McGill Dentistry: A Remarkable Rejuvenation

> "Our students acquire the basic knowledge that underlies health care, the shift toward personalized treatment and the use of radical biotechnologies."

This special issue of *JCDA* contains a series of clinical articles written by McGill faculty and students, along with 3 features on our teaching, research and outreach activities that summarize the transformations brought about by the redesign of our mission and programs some 12 years ago. I believe we were very lucky that the Institute of Medicine (IOM), one of the U.S. National Academies of Sciences, published an analysis of the state of dental education and research just as we began this task.

The IOM report stated that "dentistry will and should become more closely integrated with medicine and the health care system at all levels: education, research and patient care." It made a series of recommendations on how this could be achieved, and we were able to incorporate most of these strategies within our new curriculum as well as our research, patient care and community outreach programs.

Most dental schools claim to train "physicians of the mouth," but very few offer comprehensive training in biomedical sciences and basic medicine. We achieve this by combining the first 4 semesters of the dental and medical programs. Our students acquire the basic knowledge that underlies health care, the shift toward personalized treatment and the use of radical biotechnologies. They also learn the fundamentals of good clinical practice and patient management along with their medical colleagues. The 2 groups of students learn to work together, improving interprofessional communication and the integration of oral and general health care.

The feature on innovative teaching summarizes key changes made to the preclinical and clinical phases of the DMD program. Dr. Marie Dagenais describes the goals of the program, the new teaching methods and technologies being applied, and how the program evolves in response to new evidence on oral health, disease processes and treatment efficacy. The clinical article on blended learning in orthodontics by Dr. Jean-Marc Retrouvey and his collaborator, Mr. Adam Finkelstein, describes in more detail the interactive, computer-based teaching techniques currently in development that use "virtual patients."

While virtual patients may be useful for teaching, it is real people who need care and none more so than those at the bottom of the socioeconomic ladder. The feature on community outreach describes the efforts of McGill professors who have been working with the Quebec government and the dental profession to try to improve access to care for those most in need. Another dedicated group has established mobile outreach clinics in collaboration with community organizations in Montreal and abroad. DMD students from all 4 years provide care, while interacting with the 40%–50% of the population who do not have a regular family dentist.

The feature on McGill's research revolution describes the transformation of a faculty threatened with closure because of low research productivity into a research-intensive institution. We compensated for our small size by collaborating with the faculties of medicine, science and engineering to develop 4 key areas of research that are important for the future of dentistry: clinical research, pain research, bone and periodontal research, and biomaterials and tissue engineering.

The influence of our student researchers is apparent in 3 clinical articles found in this issue. Two articles are co-authored by dental students from the University of Montreal who did their summer research on the transfer of new technologies within dentistry under the supervision of McGill professor Dr. Jocelyne Feine. The other clinical article, on the relationship between computer use and temporomandibular disorders, was based on the summer project of Dr. Romina Perri, a recent McGill graduate.

Finally, I would like to thank *JCDA* for giving us this opportunity to connect with our alumni and to introduce ourselves to the Journal's worldwide readership. More information about our faculty can be found at www.mcgill.ca/dentistry.

James Lund, BDS, PhD
Former dean, McGill University faculty of dentistry

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Reference: 1. Sensodyne ProNamel product packaging.

Dr. Deborah Stymiest

The First 100 Days

I am writing this column on day 100 of my term as CDA president — a significant milestone according to one individual who counselled me before my tenure. I was advised that a president's first 100 days are crucial, perhaps the best chance to make a difference with a new agenda or vision. I am pleased to report that together with the Board of Directors and CDA staff, I have been working to successfully manage a period of transition at the Association. Allow me to report on some recent initiatives and accomplishments.

> "While CDA's core vision and mission will remain the same, our strategies and actions going forward will be focused on 3 priority areas."

In June, Mr. Claude Paul Boivin began his term as CDA's new executive director. I believe that Claude Paul is the absolute right fit at the right time in the history of the Association. He is an experienced and determined executive, dedicated to working with the Board and staff to take CDA to new heights. CDA staff is second to none and works tirelessly as a team to support our collective efforts. Our Board of Directors is a group of 15 members, made up of some of the most intelligent and passionate people in dentistry. These individuals give their time unselfishly in support of the profession.

The culmination of our combined efforts is a new Strategic Priority Action Plan. Entitled *A Strong Profession, A United Community, A Healthy Public*, this document is the blueprint that outlines CDA's new focus and priorities. While CDA's core vision and mission will remain the same, our strategies and actions going forward will be focused on these 3 priority areas.

- A strong profession: The focus will be to advance the profession through national awareness campaigns and earned media. We will enhance our relationship with the federal government, and seniors' oral health care will be our primary advocacy issue for the year. CDA will also focus on expanding the body of knowledge of dentistry by observing trends affecting oral health care and by continuing to support the sound scientific and academic foundation of dentistry.
- A united community: CDA's priority will be to build a collaborative community with our corporate members and other constituents by enhancing our relationships and communication efforts. Sharing and disseminating information will be our focus and we will also look to create links with other health care groups. Work will continue in the development of a new membership model; fiscal accountability will be a priority as we strive to ensure that CDA is financially secure.
- A healthy public: There will be a renewed focus on promoting oral health and communicating the relationship between oral health and general health through increased activity in public education and media. Advocacy for improved access to oral health care will also be a priority through our government relations.

The Strategic Priority Action Plan has been circulated to our corporate members and other constituents and it has been received positively. The final document will be presented to our voting members in November for ratification.

To ensure that we achieve this renewed focus on core activities, CDA staff departments and activities have recently been realigned. Mr. Andrew Jones is now director of public affairs; Dr. Benoit Soucy, director of clinical and scientific affairs; Mr. Joel Neal, chief financial officer and director of administration; and Ms. Linda Teteruck, director of corporate affairs. The work of each department will be closely examined along with the budgetary implications of all programs and activities.

My first 100 days as CDA president have been filled with challenge, excitement and wonderful memories. I have had the privilege to cross the country and have been welcomed with respect and warm hospitality by all of my colleagues. I truly look forward to the next 265 days.

I believe that we can all be proud of the new direction that has been set for CDA. I remain optimistic that the contributions made by our dedicated volunteers and staff, epitomized by the Strategic Priority Action Plan, will last long after the first 100 days of my presidency are but a distant memory.

Deborah Stymiest, BSc, DDS
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The Modern Realities of Choosing a Practice Location

Although I too lament the shrinking number of practitioners in rural Canada,[1] I ruefully admit that I am one of the many young dentists utterly tied to an urban setting. Dr. Williams blames the desire to live in the city on ill-informed stereotypes of small-town life and the misconception that rural folk have little disposable income or have no demand for comprehensive care. I am certain he is correct, but humbly put forth that he has overlooked the changing face of dentistry and the rise of the dual-income professional couple.

Dental schools throughout North America now graduate almost an equal number of male and female dentists. Our spouses are typically fellow professionals with blossoming careers who have little interest in the operation of a dental office. True, some spouses might also be dentists or other health professionals in high demand in rural communities. But others are employed in industries that are primarily based in cities. My husband, for example, is management level in the financial sector with an American custodial bank in downtown Toronto. Therefore, he is only employable in his chosen field in major international centres.

Many of us, men and women alike, are married to people who had careers before we graduated from dental school. As such, our spouses are loath to abandon their current employers, benefits and accumulated seniority, or the start-up businesses they worked so hard to establish.

If some colleagues are lucky to have more portable partners, then the challenge becomes finding or creating adequate work opportunities in the new location. Rather than looking for work for one, they must job hunt for two.

The case can be made that the financial gain from moving out of the city will more than make up for any monies lost from a second income and that a spouse can be a stay-at-home parent or enjoy a premature retirement. I believe such a life would satisfy few highly educated and workplace-accustomed young men or women for more than a handful of years.

The unmarried dentist moving to rural Canada faces a different problem altogether — meeting other single professionals. A good friend who practised in small-town Ontario after graduation remarked that the only men she was meeting were elderly widowers. All the men her age were either happily married with school-aged kids or had left long ago to seek their fortunes in the city.

What are the solutions to this impending dilemma? While I think Dr. Williams proposes some good suggestions, I would like to respectfully add that communities, brokers or existing practice owners hoping to attract new dentists might somehow court their spouses with job or small business opportunities. Social introductions to other professionals in the vicinity would also be invaluable to those considering a rural lifestyle and location.

Dr. Maria van Harten
Mississauga, Ontario

Reference

1. Williams J. Making the case for rural and remote dental practices in Canada. *J Can Dent Assoc* 2008; 74(6):515–6.

The Right Person to Lead CDA Forward

Dr. Stymiest has convinced me that she is the right person to lead CDA forward.[1] I hope that recognizing the public health issues of access to care and early childhood caries also puts them on the agenda for CDA to address. Solutions may not be simple, but by taking one step at a time, we can solve the problems.

Dr. Luke Shwart
Calgary, Alberta

Reference

1. McNamara S. Dr. Deborah Stymiest leads CDA into a new era [President's Profile]. *J Can Dent Assoc* 2008; 74(4):313–14.

Cochrane Review Abstracts

I would advise *JCDA* readers to use caution when reading the Cochrane Review Abstracts.[1] At its worst, a meta-analysis can be extremely misleading, especially when applied to orthodontics.

It seems that some in our profession are falling over themselves to board the evidence-based dentistry (EBD) bandwagon. I expressed misgivings about EBD years ago, when it was coming to the fore. It became clear to me during my residency that some of the research performed in orthodontics was fraught with flaws. One could poke holes in many of the studies without trying very hard. But we learned to consider what the research had to say, take what good it might have to offer, and move on without considering it as law.

Now, in the era of EBD, meta-analyses are being touted as the great godsend, enabling us to deliver care based on the "best available" evidence. My concern was, and still remains, if you build a doctrine on flawed research, you have a flawed doctrine. I am also concerned that EBD will cast some of the free thinkers and innovators in our profession as "witches." Worse yet would be if conclusions based on these tenuous meta-analyses are scooped up by legislators at various levels and become prescribed as standards of care.

My concern with meta-analyses in orthodontics has been borne out

recently[2] and I would advise all to have a close look at this article. Be careful of jumping on the EBD bandwagon. While it is a laudable goal, I have always felt that there are decades of solid research required in many fields before we can draw conclusions based on meta-analyses.

Dr. Mark Antosz
Calgary, Alberta

References

1. Cochrane Review Abstracts. *J Can Dent Assoc* 2008; 74(4):333–36.

2. Papadopoulos MA, Gkiaouris I. A critical evaluation of meta-analyses in orthodontics. *Am J Orthod Dentofacial Orthop* 2007; 131(5):589–99.

CDA Responds

Thank you for your letter regarding the Cochrane Review Abstracts published in *JCDA* and the practise of evidenced-based dentistry (EBD).

CDA collaborates with the Canadian Cochrane Network and Centre to reprint abstracts from selected Cochrane Reviews that will be of interest to Canadian dentists. These reviews have been prepared by the Cochrane Oral Health Group within the Cochrane Collaboration. Systematic reviews prepared by the Cochrane Collaboration are considered to be the highest quality systematic reviews available due to the protocols and processes in place. Reviews prepared and published by other organizations may not have gone through such a rigorous and thorough process.

In a systematic review, evidence on a topic has been systematically identified, appraised and summarized according to predetermined criteria. Meta-analysis is a statistical technique that summarizes the results of several studies into a single estimate, giving more weight to results from larger studies. As you have referenced, meta-analyses can produce misleading results if done poorly, hence the need for good critical appraisal skills.

EBD is the integration of the best available clinical evidence, clinical judgment and patient values and circumstances. The introduction of EBD has had a mixed reception within the dental community. Some experienced clinicians rejected this new approach and criticized the focus on evidence from randomized controlled trials (RCTs) and systematic reviews of RCTs. There is now an understanding that evidence from the most appropriate study design is required to answer the clinical question being asked. In the absence of clinical studies, the best available evidence will be the opinion of experts — including free thinkers and innovators.

As policy makers often rely on the current best available evidence to make decisions about the care of individuals or the delivery of health services, it is important that the dental profession support the dental research effort that provides the sound evidence base for the practise of dentistry.

Dr. Euan Swan
Manager, Dental Programs
Canadian Dental Association

Article on Chlorinated Pools Has Ripple Effect in Thailand

I was very interested to read the case study on tooth erosion from swimming in improperly chlorinated pools.[1]

I live in Thailand and have been swimming at a local pool 2 to 3 times a week for the last 3 years. Like the woman in the case study, I always do front crawl and it is impossible not to get water in your mouth when you breathe. I have always noticed that my teeth felt "on edge" after being in the pool, but never thought anything more of it until recently when, very rapidly, my teeth became super sensitive and I noticed an obvious discolouration. I was amazed at how quickly they deteriorated after that. I guess that with the eroded enamel there is less protection and the erosion rate escalates. I am 32 years old with no previous fillings or dental work, but now I am going to need veneers or some other treatment.

The pool that I (used to) go to is also used for offshore safety training where helicopters drop down life rafts for trainees wearing boiler suits. When I complained about the chlorine levels at the pool, the staff openly admitted to using more than the recommended levels (and obviously not enough alkali to balance the pH) due to the pool's heavy usage. Incidentally, they use stabilized chlorine as opposed to chlorine gas.

I will be dropping off a copy of the article to the pool staff because I don't want others to suffer the same dental problems I have experienced. Hopefully this will result in some corrective action.

I thought your readers might be interested to hear of another case and know that the article is helping by raising awareness.

Mr. David Brent
Thailand

Reference

1. Dawes C, Boroditsky CL. Rapid and severe tooth erosion from swimming in an improperly chlorinated pool: case report. *J Can Dent Assoc* 2008; 74(4):359–61.

One of the Authors Responds

I was surprised but pleased to learn that our article was read in a country as far from Canada as Thailand.

Our aim in writing the case report was to alert dental practitioners to the fact that improperly chlorinated swimming pools may be a danger to the teeth of their patients. It is a great credit to *JCDA* that it makes its content freely available on the Internet, which allowed Mr. Brent to determine the cause of his own dental erosion problem.

More recent correspondence with Mr. Brent suggests that the

Continued on page 576

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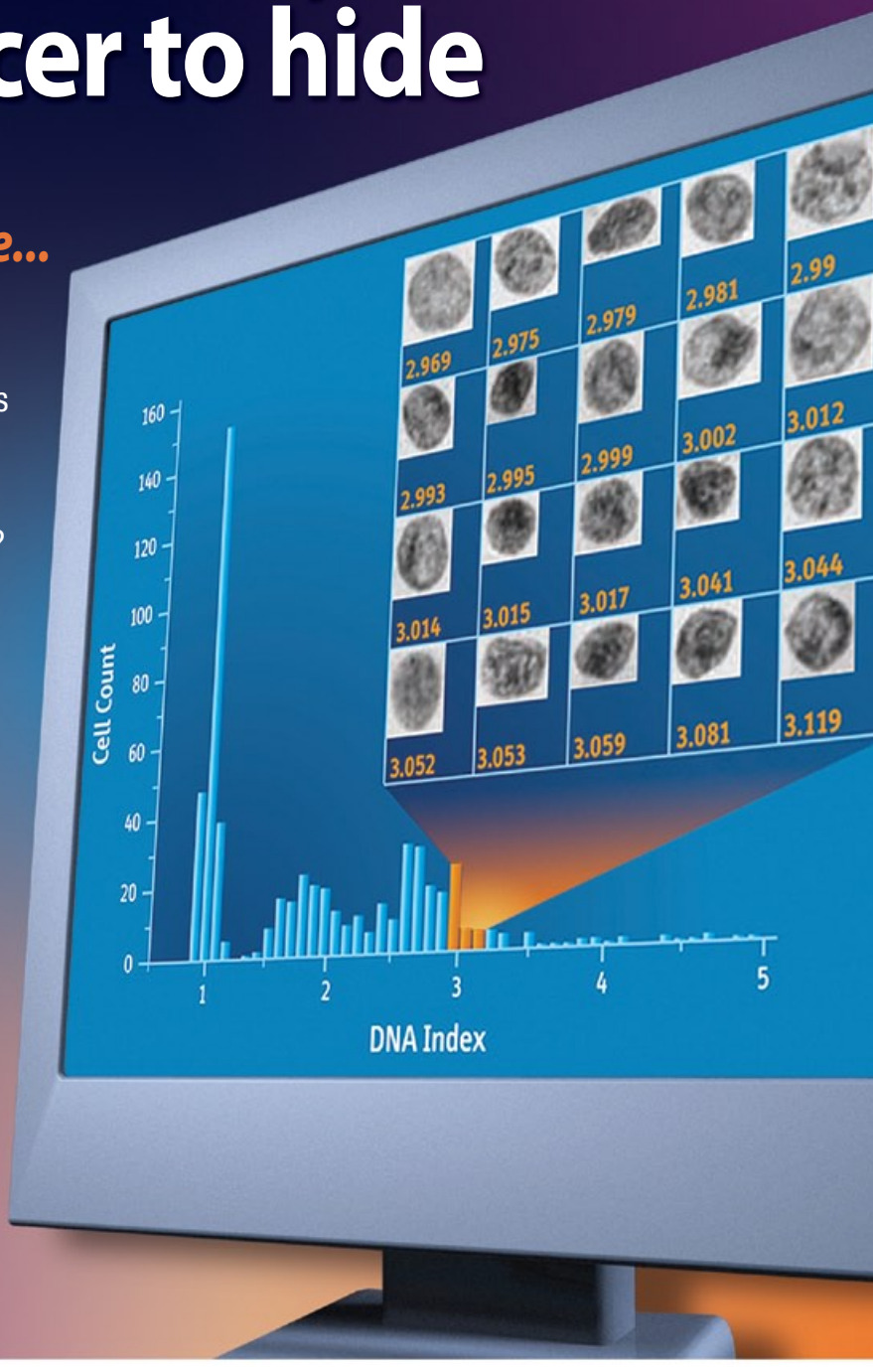

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Continued from page 574

operators of the swimming pool are now taking action to ensure that the pool will be properly chlorinated in the future. Our article seems to have had a positive effect!

Dr. Colin Dawes
University of Manitoba
Winnipeg, Manitoba

Applying to Specialty Programs: What to Know Before You Go!

Most students enter undergraduate dentistry uncertain of the path they will choose upon completion. Only as the end nears does one begin to ponder various options. Many select private practice, while others consider an advanced graduate residency program. Some, like myself, feel they have recognized their passion early in their careers and aim for a specialty.

I would like to discuss my experiences with the specialty school application process. While it appears to be a simple task, navigating the application process is demanding and pivotal to one's success.

Before the actual application process begins, students must weigh the relative strengths of the schools they might attend. Some of these offer a master's degree, others certificates and some PhDs. The division of time allotted to research as well as didactic and clinical training ranges widely. Many other variables come into play. For example, can you live in the given city during your studies or maybe your life? What about family, friends and loved ones?

When you've selected your potential schools, a typical application requires essays, letters of reference, superior board scores and funds to support the application fees. To add to the load, documents must be sent to different people at different times and must follow strict presentation formats.

After sending off the required information, an invitation for an interview might ensue. You must capitalize on this opportunity to increase your chances of acceptance. Although interviews vary in their formality, one underlying theme is recognition of a well-rounded individual. Schools must feel that you will get along with everyone in an intimate working environment. The question is, how do you prove this?

Being selected to multiple programs can be a double-edged sword as one must be careful about what information to divulge to each school. Schools are aware that other programs are vying for the same candidates and will pressure you to reveal where you've applied, interviewed or been accepted. You must walk a fine line as you try to keep certain doors open while not closing others.

After having gone through the lengthy and demanding application process, I have gained a greater understanding of how to be a more competitive and successful candidate. I was fortunate to develop a mentor-like relationship with Drs. Howard Tenenbaum, Bruce Freeman and Yair Lenga at the University of Toronto. These individuals offered invaluable advice and I would personally like to thank them for helping me recognize and achieve my passion in periodontology.

I hope this letter will be informative to future specialty school applicants and will help facilitate the application process as they pursue their own ultimate goal of becoming specialists.

Dr. Phil Walton
Toronto, Ontario

NOTE: After graduating from the University of Toronto in 2008, Dr. Walton is now pursuing postgraduate training to receive his certificate in periodontology and a master's of medical science in oral biology at Harvard School of Dental Medicine in Boston, Massachusetts.

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Seniors' Oral Health Emerges as Priority Issue at CDA Board Meeting

The CDA Board of Directors held a planning session during its June meeting in St. Andrews-by-the-Sea, New Brunswick, to set short- and long-term directives for the Association. The newly identified strategic priorities can be summed up as "Strong Profession, United Community, Healthy Public." Under this banner, the Board identified a streamlined list of CDA priorities and actions, and singled out issues that will take precedence during the future allocation of resources.

A significant outcome of the meeting was identifying access to care for seniors as the key government relations issue for the coming year. As such, the Board directed CDA staff to facilitate coordinated action with corporate members and stakeholders on this issue.

Seniors' oral health was front and centre at the meeting as the Board accepted the *Report on Seniors' Oral Health Care* — a document prepared by CDA's Seniors' Task Force under the guidance of the Committee on Clinical and Scientific Affairs. The Board noted the comprehensiveness and quality of the report and pledged to prioritize its recommendations.

Among other noteworthy agenda items, the Board received the final report of the Relationships and Communications project team — one of the special project teams created by CDA in August 2007. The team's report outlined 6 key recommendations, including establishing protocols to maximize the efficiency and effectiveness of CDA's communications efforts, both internally and externally. This will occur under the direction of Mr. Claude Paul Boivin, the new CDA executive director. The Board asked that one additional recommendation be added to the list, that of regularly monitoring relationships and communications in the future.

CDA Public Education Program Update: Summer Oral Health Insert

CDA, in collaboration with the provincial dental associations, produced a 9-page oral health insert in the summer issue of *Canadian Health and Lifestyle* magazine. Featuring interviews with CDA president Dr. Deborah Stymiest, as well as Dr. Joel Antel, chair of the Communications Committee of the Manitoba Dental Association, Dr. Alastair Nicoll, president of the British Columbia Dental Association, and Dr. Larry Levin, president of the Ontario Dental Association, the insert focused on oral cancer, dental anxiety, the risks of oral jewelry, and the cause and prevention of tooth decay and dental erosion.

Canadian Health and Lifestyle is a quarterly publication circulated across Canada to all Rexall pharmacies and high-volume health practitioner waiting rooms, including dentists and physicians, and has a readership of more than 2 million.

The ongoing key messages of CDA's Public Education Program (PEP) are the promotion of the primacy and role of the dentist, the value of regular dental care, the importance of a healthy mouth for a healthy body, and the value of the CDA Seal of Recognition. Key messages on oral cancer have also been developed for 2008 and are being communicated to Canadians through various year-round campaigns, including National Oral Health Month.™

CDA's PEP is also continuing the expansion of the Patient Information Brochures series to include 8 more titles scheduled for release by the end of the year.

The oral health insert can be viewed online at: www.healthandlifestyle.ca/Health/Dental/Oral_Health.aspx

Seniors' Oral Health Care Report

A *Report on Seniors' Oral Health Care* was approved and accepted by the CDA Board of Directors at its meeting in June. The report is a comprehensive document that outlines a national strategy to address the challenges associated with the delivery of oral health care for seniors in Canada.

In February 2006, CDA's Committee on Clinical and Scientific Affairs (CCSA) was tasked by the Board to review the report that came out of a national forum on seniors' health care organized by CDA in 2005. The CCSA appointed a Seniors' Task Force, chaired by CCSA member Dr. Chris Wyatt of Vancouver, to set priorities on recommended activities. Drs. Mary McNally, Aaron Burry, Clive Friedman and Trey Petty were also on the task force, representing different interest groups from across Canada with a special focus on geriatric dentistry.

The introduction to the report notes, "CDA recognizes that many seniors face substantial barriers and profound disparities in accessing needed dental services, resulting in poor oral and general health outcomes, with a negative impact on quality of life in the declining years at a time often characterized by increasing disability and decreasing independence.

To confront the critical issues facing seniors' oral health care in Canada, CDA brought together corporate and clinical leaders from across Canada in 2005 to identify the key issues, to develop a national shared vision and to take action in meeting the significant challenges inherent in promoting optimal oral health for the elderly."

To adequately assess the situation in Canada, the Seniors' Task Force catalogued seniors' oral health care activities and programs currently offered by the provincial dental associations. They also reviewed relevant academic literature, considered the Oral Longevity Project 2007 of the American Dental Association, and examined documents related to competencies for beginning dental practitioners and accreditation of dental programs in Canada.

As the report states: "The profession now needs to take stock of its resources and professional development in order to meet the emerging needs of the coming decades and to address the retirement of a significant portion of the Canadian workforce."

The report's recommendations fall under 4 broad categories: education, delivery of care, research and strategic planning. Some of the main recommendations include developing a service model for delivery of care to seniors, developing standards for daily oral hygiene in long-term care facilities, lobbying for increased geriatric research and developing a communication strategy to raise awareness of geriatrics with the dental profession, government and the public.

The CDA Board acknowledged the efforts of the Seniors' Task Force and the importance of the report now that access to care for seniors has been identified as the primary government relations issue for CDA in the coming months. The full report can be found on the members' side of the CDA website.

CDA Teaching Conference on Implant Education a Success

Dental educators and specialists from across Canada met in Toronto on May 8 for a CDA teaching conference on dental implant education. The session, titled "Implant Education from Beginner to Expert — The Roles of Dental Faculties," examined current theories and techniques in implant education for undergraduate and postgraduate students at Canadian universities, as well as for practising dentists.

Dr. David Mock, dean of the University of Toronto faculty of dentistry and president of the Association of Canadian Faculties of Dentistry, provided a welcoming address to the participants of the 1-day conference.

The line-up of presenters for the morning session was impressive, as both Canadian and international experts offered their insights on implant dentistry. The presentations began with Dr. Clark Stanford of the University of Iowa College of Dentistry, who spoke about the evolving role of implant dentistry in predoctoral education. The chair of the conference's organizing committee, Dr. Asbjørn Jokstad of the University of Toronto, then gave his unique perspective on both Scandinavian and Canadian opportunities for learning dental implant techniques.

Dr. Ron Bannerman of Dalhousie University and Dr. Chris Wyatt of the University of British Columbia addressed the issue of implementing implant dentistry education programs in Halifax and Vancouver respectively. Dr. Jocelyne Feine of McGill University focused on the challenges facing dental students and dentists in evaluating new technologies, including dental implants. Finally, Dr. Brian Kucey of the University of Alberta gave a presentation on the role of the dental student in dental implant programs.

In the afternoon session, conference participants formed small groups to address specific questions identified by the conference organizing committee. A plenary session then brought the groups back together to discuss the next steps in advancing dental implant education in Canada. A consensus that emerged from the discussions was that dental students should be better trained to assess new technologies and be proficient in implant rehabilitation.

The group concluded the session by identifying ways that Canadian dental faculties can work together in dental implant education. The focus was primarily on the need for improved communication between the faculties. Some suggestions put forward to achieve this goal were identifying 1 key person at each dental faculty to act as a liaison with other universities, encouraging more collaborative implant research and sharing core curriculum content between universities.

Dentistry Canada Fund
Fonds dentaire canadien

CDA is grateful for the support of the Dentistry Canada Fund and the Royal Bank of Canada, sponsors of the teaching conference on implant education. Special thanks are also extended to the conference chair, Dr. Jokstad, along with the other members of the organizing committee Drs. Bannerman, Feine and Wyatt. CDA staff members Dr. Benoit Soucy, Dr. Euan Swan and Ms. Sylvia Lefebvre provided support to the organizing committee.

RBC

Launch of New Hygiene Centre

A new dental hygiene clinic opened in Toronto in July, advertising itself as an affordable and convenient alternative to hygiene services offered in a traditional dental office. The Independent Dental Hygiene Centre (IDHC) is located on Yonge Street in Toronto's midtown district, close to the Eglinton Avenue subway station.

The entrepreneurs behind this new venture are University of Toronto dentistry graduates Drs. Howard Rocket and Brian Price — the same dentists behind the Tridont Dental Centres that opened over 100 locations across Canada in the 1980s.

During a July 7 television interview on the Business News Network's *SqueezePlay* program, Drs. Rocket and Price explained that they are looking to "evolve the Tridont concept" for the new IDHC clinics. The owners outlined their short-term plans to open 2 additional centres near the Sheppard Avenue and King Street subway stations in Toronto. Once they have refined the concept at these 3 locations, they plan to expand to 50 centres.

The 2 dentists say the idea for the IDHC clinics came in response to the Ontario government amending the Ontario Dental Hygiene Act in September 2007. The Act permits dental hygienists to clean an individual's teeth without the presence of a dentist.

In a press release announcing the opening of the flagship location, the IDHC markets itself as "offer[ing] more affordable services in a relaxing environment, with reduced waiting times and longer hours, including evenings and weekends, at locations near the subway, making it easier for people to make oral health a priority."

A former dental clinic was retrofitted for the first IDHC location. Drs. Rocket and Price note that lower overheads, such as not having to lead-line walls for radiography purposes, are crucial in being able to offer comparable compensation to dental hygienists while offering low prices to the public. For the opening of the first centre, the IDHC advertised a "$99 introductory offer covering the initial assessment, cleaning, plaque removal, intraoral camera photos and polishing (up to one hour) by a registered and licensed dental hygienist." The company website also lists the cost of a "whitening treatment" for $149.

At the IDHC, Drs. Rocket and Price say that the hygienists will be licensed and independent, while the IDHC group will "take care of the business side." They want to "enable hygienists to meet their goals" by offering additional career opportunities in a supervisory or teaching capacity. The teaching opportunities likely relate to a brief mention during the *SqueezePlay* program that Drs. Rocket and Price had recently acquired a dental hygiene school.

For more information, see www.independentdentalhygiene.com.

RCDSO Finalizes Specialty Certificate in Anesthesia

The registration process and fee schedule for the Specialty Certificate in Anesthesia examination were officially finalized during a Royal College of Dental Surgeons of Ontario (RCDSO) Council meeting in July. With these remaining elements in place, the RCDSO can now formally offer a Specialty Certificate in Dental Anesthesia to qualified dentists.

In August 2007, the Ontario government passed legislation approving Dental Anesthesia as a dental specialty in Ontario. The government placed the responsibility for the registration of dental specialists with the RCDSO.

Those interested in applying for the specialty designation must first complete an application to determine eligibility to take the specialty exam. These requirements include having a dental degree, specialty training in dental anesthesia (with a minimum of 12 months of full-time instruction before 1986 or a minimum of 22 months after 1986) and having completed the College's approved specialty examination in dental anesthesia. The RCDSO's Registration Committee must also be satisfied that an applicant possesses the knowledge, skill and judgment at least equivalent to that of a current graduate of the specialty program in dental anesthesia offered by the University of Toronto faculty of dentistry.

For complete details on how to apply for this specialty in Ontario, visit the RCDSO website at www.rcdso.org.

Mobile Oral Cancer Screening

Members of the B.C. Cancer Agency at an oral cancer screening clinic in Vancouver's Downtown Eastside.

The B.C. Cancer Agency is launching a new mobile screening program in Vancouver's Downtown Eastside (DTES) in an effort to reach out to a community most at-risk for oral cancer.

Dr. Catherine Poh, outreach program leader of the B.C. Cancer Agency's Oral Cancer Prevention Program, explains: "One in 10,000 British Columbians is diagnosed with oral cancer annually, but the incidence rate is alarmingly higher for residents of the DTES, where 1 in 150 suffers from oral cancer."

Many residents in the DTES are at increased risk for oral cancer as a result of heavy tobacco and alcohol consumption (established risk factors for this disease), compromised immune function, poor nutrition and oral hygiene, and limited access to medical and dental care.

"We're taking a proactive approach and screening for oral cancer in populations of people more likely to get this cancer," notes Mr. George Abbott, B.C. minister of health.

Patients who take part in the mobile screening clinics will receive a conventional head and neck and intraoral exam, followed by an examination with a hand-held blue light device that helps detect precancerous and cancerous lesions that may not be visible to the naked eye.

"We learned that a majority of residents are not used to travelling far from the area where they reside, even if it's a short distance," says Dr. Poh. "It was clear that we needed to create a comfortable and safe environment for them to come to get screened. The mobile screening clinic is an important addition to the community, providing access to oral cancer screening to those who do not visit the dental clinic," she concludes.

DIAC Future of Dentistry Survey

The Dental Industry Association of Canada (DIAC) announced preliminary results of the 12th annual Future of Dentistry survey, along with the names of the winning dentists who completed the survey.

Among the noteworthy survey results, 12.5% of dentists spent over 250 chairside days in their practice over the past year, a significant increase from the 5.7% indicated on the 2007 survey. These figures contrast with a consistent 40% of respondents spending 150 to 199 days chairside in each of the past 2 years.

The survey also found relatively constant responses regarding the average number of patients treated per day over the past 2 surveys. More than three-quarters of dentists (76.2%) treated less than 15 patients per day and approximately 20% treated 15 or more in 2007 and 2008. Overall, dentists treated 12.7 patients in an average day.

Over 1,000 practising Canadian dentists responded to this year's survey and there was good proportional distribution across all regions of the country. To reward dentists who complete the survey, DIAC randomly selects 11 Canadian practitioners to win travel vouchers.

Dr. Natalie Brothers of Bedford, Nova Scotia, is this year's grand prize winner of a $1,000 travel voucher. The 10 consolation prize winners will receive $100 travel vouchers. The 10 dentists are: Dr. Caroline Campbell of Drummondville, Quebec; Dr. Monica Malhotra of Mississauga, Ontario; Dr. Sylvain Drapeau of Campbellton, New Brunswick; Dr. Felicity Hardwick of Nanaimo, B.C.; Dr. Richard Bell of Duncan, B.C., Dr. Arthi Kumar of Windsor, Ontario; Dr. Jacques Carrier of Orleans, Ontario; Dr. Adrian F. Power of Conception Bay South, Newfoundland; Dr. John Gourley of Bible Hill, Nova Scotia; and Dr. Kevin Hamm of Edmonton.

Conducted by Eric P. Jones and Associates with the cooperation of *JCDA*, the survey is designed to help DIAC member companies tailor their product and service offerings to meet the needs of Canada's dentist population.

UWO Signs Collaboration Agreements with Brazilian University

From left: Dr. Gildo Santos and Dr. Jeffrey Dixon from the UWO Schulich School of Medicine and Dentistry with Dr. Maria Fedela de Lima Navarro, Dr. Luis Fernando Pegoraro and Dr. Marco Antonio Bottino of Brazil.

Representatives of the University of Western Ontario (UWO) and the University of São Paulo in Brazil signed 2 exchange agreements in July designed to benefit dental students and oral health research at both institutions. The agreements cover student exchanges and research collaborations.

Dr. Gildo Santos, a faculty member in restorative dentistry at UWO, started the discussions that led to this international collaboration. Dr. Santos obtained his PhD from the University of São Paulo and did research at the University of Toronto as part of an exchange program.

"We are very pleased to be entering into this partnership which will benefit both universities, not only on the scientific and academic level, but also culturally," says Dr. Harinder Sandhu, director of Schulich Dentistry at UWO.

It is anticipated that students from São Paulo will spend up to 2 years in Canada carrying out collaborative research in skeletal biology and dental materials — 2 areas of strength at UWO. Similarly, UWO students and researchers will benefit from the expertise and capacity for clinical and translational research in dentistry at the University of São Paulo.

The Brazilian delegation visiting UWO included Dr. Maria Fidela de Lima Navarro of the Bauru School of Dentistry at the University of São Paulo. She is currently the vice-president of the International Association for Dental Research.

Canadian Faculty Attend Tucker Study Club Course

In June, 50 dental faculty members from across Canada and the United States gathered at the University of Washington School of Dentistry for a complimentary Richard V. Tucker Academy Cast Gold Course. Representatives from 4 Canadian dental schools and 17 U.S. schools were partnered together to prepare, fabricate and seat at least 4 gold castings per pair. The dentists were instructed by mentors and long-time members of Seattle's Tucker Study Club #3, Dr. Richard V. Tucker Sr. and Dr. Richard D. Tucker Jr.

Drs. Ingrid Emanuels and Mark Fogelman of the University of British Columbia photograph a completed gold restoration at the Richard V. Tucker Academy Cast Gold Course.

Dr. Ingrid Emanuels, clinical assistant professor in the faculty of dentistry at the University of British Columbia, attended the week-long course and shared her thoughts with *JCDA*:

"As a participating faculty member, it was a humbling yet invigorating experience to work in the presence of such practised and credentialed peers. It was enlightening to be a student again and feel the anxious anticipation of the first words from the mentor's mouth and the effect those words have on one's ability to learn.

The learning opportunities were frequent and valuable. Not only did we learn how to produce excellent quality gold castings with imperceptible margins and mirror-like finishes, we also learned about the gentle, respectful and encouraging mentoring style which is characteristic of the Tucker Study Clubs.

The week was about so much more than gold castings. The collegiality and camaraderie of working with faculty from all over North America built connections and friendships that can only continue to improve what we do. Thank you Dr. Richard V. Tucker and friends for giving back to the profession."

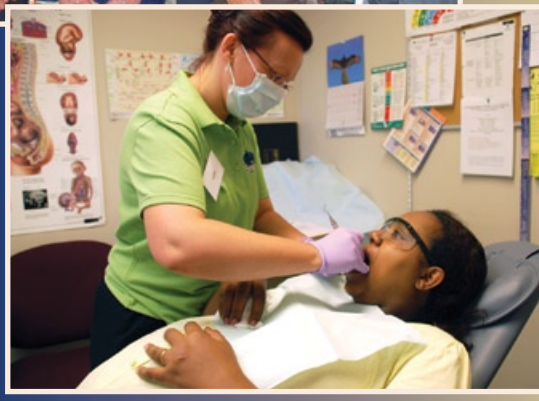
Urban Smiles: University of Manitoba's Outreach Effort

A team of volunteers from Winnipeg's dental community, including dental practitioners, hygienists and assistants, joined the University of Manitoba's Centre for Community Oral Health (CCOH) at the Aboriginal Health and Wellness Centre on June 11 for Urban Smiles — a day dedicated to improving the oral health and overall health of children, pregnant mothers, people with diabetes and others needing oral care.

According to CCOH director Dr. Doug Brothwell, Urban Smiles is really just business as usual for the community outreach arm of the faculty. "It's a little known fact that for many years now, the faculty of dentistry has been a major source of care for the underserved," he said. "Today, we are celebrating what we do every day of the year."

Urban Smiles marked 35 years of community outreach for the faculty of dentistry at the University of Manitoba. As part of the event, 5 Manitoba alumni were honoured for their contribution to community outreach in dentistry: Drs. Art Schwartz, Olva Odlum, Phil Poon, Margot Pilley and Henry Redhead. Canada's Chief Dental Officer Dr. Peter Cooney, a former executive director of Manitoba Dental Health, was also honoured for his contributions to dental public health.

From left: Dr. Phil Poon, Dr. Margot Pilley, Dr. Anthony M. Iacopino, Manitoba Premier Gary Doer, Dr. Doug Brothwell, Dr. Olva Odlum and Dr. Henry Redhead.



Hirut Gebrehiwot, a new Canadian from Ethiopia and expectant mother, receives treatment as part of the Urban Smiles outreach program.

Faculty dean Dr. Anthony M. Iacopino noted that in addition to marking a significant milestone for the faculty and CCOH, Urban Smiles could be considered a model for the future of health care delivery. "We want the province of Manitoba, through the faculty, to be a showcase for how one can take oral health care and make it part of comprehensive health care for all people and actually save health care dollars and improve quality of life by preventing chronic inflammatory diseases like diabetes, heart disease, arthritis and respiratory disease."

Briefs

FDI Supports Fluoride Promotion

A study led by FDI researchers is the first to quantify the affordability of fluoride toothpaste throughout the world.[1] The study, comparing data from 48 countries, is published in BioMed Central's open access journal *Globalization and Health.*

Researchers found that the poorest populations of developing countries do not have the means to buy affordable toothpaste, the most widely used method of preventing tooth decay. Currently, only about 12.5% of the world's population benefits from fluoride toothpaste.

Support for this research is part of FDI's ongoing campaign to promote the use of appropriate fluoride for better oral health. In 2006 and 2007, FDI, in partnership with the World Health Organization and the International Association for Dental Research, held 2 expert consultations to discuss and analyze the impact of delivery methods and advocacy strategies related to fluoride and oral health. Both conferences resulted in declarations that called for the promotion of oral health through fluoride.

More information about the consultations and conference declarations can be found at www.fdiworldental.org/public_health/3_2fluoride.html.

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1. Goldman AS, Yee R, Holmgren CJ, Benzian H. Global affordability of fluoride toothpaste. *Global Health* 2008 Jun 13; 4:7.

University of Manitoba Students Win OSAP Contest

University of Manitoba third-year dental students Philip Kim and Jasrit Pahal were among the winners of the Organization for Safety and Asepsis Procedures (OSAP) "I See IC" contest. The students' video entry, "Proper Placement of PPE," won in the Best Infection Control Message category.

The contest was designed to promote infection control and safety by inviting dental professionals to create videos and photos. A DVD on infection control is being created that will include the finalists' entries and additional material. Winners were picked through online voting. Founded in 1984, OSAP is dentistry's premier resource for infection control and safety information. To view the winning entries, visit www.osap.org.

Passport Guarantor Reminder

Passport Canada has implemented a new Guarantor Policy that enables most Canadian adult passport holders to act as a guarantor. If you choose to sign a passport application as a guarantor, you will now be signing as a passport holder, not as a member of a professional group. Choosing to act as a guarantor is voluntary. If you feel that you do not know an individual well enough to sign a passport application, you are under no obligation to do so.

To qualify as an eligible guarantor, one must be a Canadian citizen 18 years of age or older; hold a 5-year Canadian passport that is valid or has been expired for no more than 1 year; have been 16 years of age or older when he or she applied for his or her own passport; have known the applicant personally for at least 2 years.

Guarantors must now provide their passport number, date of issue and expiry date when signing passport applications.

Family members may act as a guarantor, as well as an individual residing at the applicant's address, provided he or she meets the specified requirements. However, if you are the parent or legal guardian applying for a passport for your child, you cannot act as guarantor.

For more information, visit www.passportcanada.gc.ca.

• Issues in Brief •

The Oral Health Care Professional and the Immigrant Patient

Dr. Christophe Bedos, DCD, PhD

Objective

Provide oral health professionals with information on immigration, acculturation and a patient-centred approach.

Immigration in Canada[1]

- Canada is a land of immigrants: it welcomes approximately 180,000 new immigrants every year; in 2001, 18% of the population was foreign born.
- Whereas Europe constituted the main source of immigrants until the 1960s, Asia is now the leading continent of origin. Between 1991 and 2001, Asia provided 58% of all immigrants in Canada.
- Chinese constitute the main visible minority group in Canada, with over 1 million people in 2001.

The acculturation process[2]

- Acculturation is the process by which an immigrant acquires the culture of the society that he or she inhabits. Acculturation applies to oral health-related beliefs and behaviours.
- Acculturation can take 4 forms according to Berry[2]:
  1) *marginalization* means that the immigrant values neither heritage nor host community cultures
  2) *separation* implies that the immigrant values only heritage culture
  3) *integration* means that the immigrant values both heritage and host community cultures
  4) *assimilation* signifies that the immigrant rejects the heritage culture and adopts the culture of the host community.

Cultural competence and patient-centred approach[3]

- Cultural competence — a growing concern for health care professionals — means sensitivity to the culture of patients in order to provide high-quality services.
- Taking patients' culture into account may be done through a *patient-centred approach* that includes the following steps:
  1) exploring disease but also illness experience (how the patient experiences the symptoms)
  2) understanding the whole patient (the person; his/her context; his/her culture)
  3) finding common ground when treatment planning.
- The patient-centred approach demands time, patience and good communication skills from the oral health professionals.

An example of acculturation related to oral health beliefs[4]

- *Objective*: Understand how oral illness is perceived by Chinese immigrants.
- *Methods*: Semi-structured interviews conducted in 2005 with 12 well-educated, recent, Chinese immigrants living in Montreal.
- *Results*: These immigrants' beliefs are a *mix of biomedical and cultural knowledge*:
  a) fairly good understanding of caries in terms of etiology as well as means to prevent and treat them
  b) strong traditional beliefs concerning periodontal problems or "swollen gums" which, as they say, are associated with "internal fire" (**Table 1**).

Table 1 Chinese immigrants' beliefs with respect to caries and "swollen gums" (adapted from Dong and others[4])

Chinese patients' perception	Dental caries	"Swollen gums"
Perceived etiology	Oral hygiene Food Genetics	Local factors: oral hygiene General factors: *Internal fire*
Perceived pathological process	Irreversible	Reversible
Perceived means of prevention	Improve oral hygiene Avoid sweet food Consult dentist regularly	Local factors: improve oral hygiene General factors: rest, avoid stress, eat well
Perceived treatment needed	Consult dentist	Local factors: antibiotics, consult dentist General factors: take herbs (*Xiguashuang*)

- *Conclusion*: These results exemplify *integration* related to oral health-related beliefs, as the persons interviewed valued both their ancestral medical culture and the medical culture of Canada, their host country. They cannot be generalized because:
  a) the sample is not representative of the population
  b) the acculturation process may take different forms in other contexts.

Conclusions and recommendations for oral health professionals

- Be open to the culture and the oral health beliefs of the immigrant patients.
- Try to understand and respect each patient's perception of oral health and illness.
- Be realistic and find common ground when defining the treatment plan.

Dr. Bedos *is an associate professor in the division of oral health and society, faculty of dentistry, McGill University, Montreal, Quebec.*

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"Issues in Brief" is designed to condense and summarize current clinical research on important oral health-related issues. These summaries "translate" clinical articles into a more accessible style to help dental professionals understand important research findings. If you would like to contribute to this section, contact editor-in-chief Dr. John O'Keefe at jokeefe@cda-adc.ca.

Surveillance Spotlight...

What Is the Relationship Between Periodontal Disease and Cancer?

by Anthony M. Iacopino, DMD, PhD

The International Centre for Oral–Systemic Health, based at the University of Manitoba's faculty of dentistry, was launched in January 2008. The centre is proud to partner with *JCDA* to provide summaries of contemporary literature and news in oral–systemic health that may affect modern dental practice. This month's article discusses the possible connections between periodontal disease and cancer.

Periodontal disease is a chronic inflammatory condition that is highly prevalent in adult populations. Worldwide estimates for severe periodontitis generally range between 10%–15%, and as much as 90% of adults may be affected by milder forms of periodontal disease, including gingivitis.[1]

There has been much recent interest in possible connections between periodontal disease and various types of cancer. Several studies have reported associations between periodontal diseases and risk for certain types of cancers, including oral, upper gastrointestinal, lung and pancreatic cancer.[2] In some studies the connections seem to be significantly affected by other major risk factors such as smoking, diet and socioeconomic status, while other studies show robust relationships between periodontal disease and risk for cancer, even after careful adjustment for confounding factors.

Oral Cancer

There have been 6 rigorous case control studies examining the association between periodontal disease and oral cancer.[2] Five out of the 6 studies indicated a 2- to 3-fold increase in oral cancer risk after controlling for smoking and alcohol use. Viruses may be the mechanism in these cases. It has recently been demonstrated that periodontal lesions contain the carcinogenic cytomegalovirus and Epstein-Barr virus.[3] Recently, a strong relationship between the human papilloma virus (HPV) and oral cancer has also been shown.[4] Increased production of carcinogenic nitrosamines in the oral cavity by nitrate-producing bacteria within periodontal lesions may be another mechanistic factor.[2]

We know that there is a strong relationship between chronic inflammation and some types of cancers. It is possible that the chronic systemic inflammation induced by periodontal disease serves to promote already initiated cells, leading to loss of normal growth control and carcinogenesis.[5]

Upper Gastrointestinal and Gastric Cancer

A review of 4 studies examined associations between periodontal disease and cancers of the trachea, esophagus and stomach.[2] There appears to be a dose–response relationship between periodontal disease severity and the risk of developing gastric cancer. This risk increases up to 2 times for those below 50 years of age. The possible mechanisms include those already mentioned for oral cancer. An additional consideration is the presence of *Helicobacter pylori* in the periodontal flora.

Lung Cancer

Several studies have examined the association between periodontal disease and lung cancer. Although some studies have demonstrated strong associations, these results are not confirmed by studies that restrict subjects to those who never smoke.[2] Therefore, no definitive conclusions on the link between periodontal disease and lung cancer can be made, even though other studies have shown a strong association between smoking and lung cancer.

Pancreatic Cancer

There have been 3 well-designed cohort studies on the link between periodontal disease and pancreatic cancer. Two of these show a strong association after controlling for known confounding factors such as smoking.[2] The data indicate much

stronger associations in those who never smoke (up to a 3-fold increase in risk). The possible mechanisms include those already mentioned for oral cancer.

Conclusion

To date, a limited number of investigations can be used to analyze the relationship between periodontal disease and various cancers. At this point, the data suggest some potential concerns with links between periodontal disease and oral, upper gastrointestinal, gastric and pancreatic cancer, but there is no reliable data to support any link to lung cancer. Further research is needed to confirm the present findings and to help explain the underlying biological mechanisms. These studies will have to rigorously control for confounding factors such as smoking, diet and socioeconomic status. In fact, the studies should probably be restricted to subjects who never smoke, include dietary monitoring (fruit, vegetable and vitamin C intake) and examine individuals with documented healthy immune systems. In this way, we can be sure that periodontitis is not simply a marker for compromised immune systems that are not able to clear infection and perform effective surveillance for tumour growth.

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Dr. Anthony M. Iacopino *is dean, professor of restorative dentistry and director of the International Centre for Oral–Systemic Health at the faculty of dentistry, University of Manitoba, Winnipeg, Manitoba. Email: iacopino@cc.umanitoba.ca.*

Alberta Honours Dr. George Zarb

Dr. George Zarb of Toronto was presented with Honourary Membership in the Alberta Dental Association and College (ADA&C) at a ceremony held in Jasper in May. Honourary Membership is the highest award given by the ADA&C, recognizing individuals from outside Alberta who have made outstanding contributions to the art or science of dentistry or to the dental profession over a sustained period of time.

Dr. Zarb was professor and head of prosthodontics at the faculty of dentistry at the University of Toronto until his retirement from academia. His clinical research was in implant prosthodontics and the clinical management of temporomandibular disorders.

He has written more than 150 papers on different aspects of prosthodontics and is co-author of 13 textbooks. Dr. Zarb continues to practise his specialty in Toronto and is editor-in-chief of the *International Journal of Prosthodontics.*

Dr. Zarb has received numerous awards throughout his career, including honorary doctorates from the University of Gothenburg, Dalhousie University, the University of Malta, the University of Montreal and the University of Turin. Dr. Zarb was recently named as a member of the Order of Canada.

Dr. George Zarb (right), ADA&C 2008 Honourary Membership recipient, with Dr. Gordon Thompson, ADA&C executive director and registrar.

American College of Dentists to Honour Dr. Harry Rosen

Dr. Harry Rosen shown with his 'earth art' creations "Little Hercules" (foreground) and "Ascent." He tells *JCDA* that the 8-foot stone sculpture "Ascent," still a work in progress, is a metaphor for man's ascent through life.

For more information visit www.drharryrosen.com.

Dr. Harry Rosen, active professor emeritus of prosthodontics at McGill University, will receive the American College of Dentists' (ACD) 2008 William John Gies Award at the ACD convocation ceremony on October 16. The award is the most prestigious honour that the ACD can bestow upon a Fellow.

According to the ACD literature, the award recognizes an ACD Fellow "who demonstrates broad, exceptional, and distinguished contributions to the profession and society while upholding a level of leadership and professionalism that exemplifies Fellowship. The impact and magnitude of such contributions must be extraordinary."

The Quebec section of the ACD put forward Dr. Rosen's name for consideration and he is truly grateful for the upcoming award. "I was honoured to receive my ACD Fellowship in 1968 and now to be recognized by my peers is something that I never could have imagined," he says.

JCDA originally featured Dr. Rosen in September 2006 in an article discussing his many passions, including dentistry, teaching, artistic endeavours and the Dr. Harry Rosen Endowed Clinical Teaching Fund. The latter is a unique initiative, created to provide financial support for young clinical teachers at McGill. Dr. Rosen is pleased to report that the Endowment is now two-thirds toward attaining its goal of $500,000 worth of donations from patients, dentists and the dental industry.

Dr. James Lund Receives Quebec Research Award

Dr. James Lund (centre) received his award from Dr. Arlette Kolta of the University of Montreal's faculty of dentistry and Dr. Paul Allison, then director of the Network for Oral and Bone Health Research.

Dr. James Lund of McGill University is the 2008 recipient of the Advil–Micheline Blain Award. The award, created by the Network for Oral and Bone Health Research, is given every year to a scientist, a clinician or an administrator for his or her exceptional involvement in the development of oral health care. The award was presented to Dr. Lund on May 23, during the network's Scientific Day.

Dr. Lund received his dental degree from the University of Adelaide in Australia and his PhD in Physiology from the University of Western Ontario. He was a professor and vice-dean of research at the University of Montreal's dental faculty before becoming dean of McGill's faculty of dentistry, a position he held from 1995–2008.

Dr. Lund has also been president of the Canadian Physiological Society, a member of the advisory board of the CIHR's Institute of Musculoskeletal Health and Arthritis, and a founding member of the Network for Oral and Bone Health Research.

Dr. Lund has done leading-edge research on masticatory control and the causes of chronic pain. He has received numerous awards, edited 2 textbooks and published more than 200 papers.


Dr. David Alexander

FDI Appoints New Executive Director

The FDI World Dental Federation announced that Dr. David Alexander would become executive director of FDI effective August 21. Dr. Alexander takes over duties from Dr. John Hunt, who has served as interim executive director of FDI since November 2007.

A specialist in dental public health and a former general dentist, Dr. Alexander has extensive commercial and administrative experience, most recently with GlaxoSmithKline, where he was responsible for developing oral health strategy and building key partnerships with major international dental organizations and dental schools.

Dr. Alexander obtained his dental degree from the University of Liverpool, a Master's degree in Community Dental Health from the University of London and completed a residency in dental public health at the National Institutes of Dental Research in Bethesda, Maryland.


Dr. Cliff Swanlund

Alberta Elects New President

Dr. Cliff Swanlund of Calgary, Alberta, was recently named the new president of the Alberta Dental Association and College (ADA&C). A 1976 graduate of the University of Manitoba, Dr. Swanlund has been in general practice in Calgary since 1980.

Dr. Swanlund has extensive involvement with several ADA&C committees including the Continuing Competency Committee, which developed the competency profile for dentists in Alberta. He was also a member of the ADA&C's Task Force on Advertising, the Task Force on Conscious Sedation and the Committee on Infection Prevention and Control Standards for the Dental Office.


Dr. Frédéric Duke

President of New Brunswick Dental Society

Dr. Frédéric Duke of Moncton, New Brunswick, was recently named the new president of the New Brunswick Dental Society (NBDS).

Dr. Duke is a 1998 DMD graduate of Laval University. He previously served as a board member of the NBDS and chair of the Moncton Mediation Committee. Dr. Duke maintains a private practice in general dentistry in Moncton.

OBITUARIES

Aitken, Dr. William (Bill) J.: A 1952 graduate of the University of Alberta, Dr. Aitken of Prince George, British Columbia, passed away on July 1.

Banting, Dr. Ronald W.: A 1974 graduate of the University of Toronto, Dr. Banting of Niagara Falls, Ontario, passed away on July 15.

Blackmore, Dr. Robert V.: Dr. Blackmore of Sherwood Park, Alberta, passed away on June 29. He graduated from the University of Alberta in 1943.

Lane, Dr. Arnold (Arne) H.: A 1949 graduate of McGill University, Dr. Lane of Victoria, B.C., passed away on July 6.

Ng, Dr. George C.: Dr. Ng of Vancouver, B.C., passed away on July 13. He graduated from the University of Toronto in 1969.

To access the websites mentioned in this section, go to the September 2008 *JCDA* bookmarks at www.cda-adc.ca/jcda/vol-74/issue-7/index.html.

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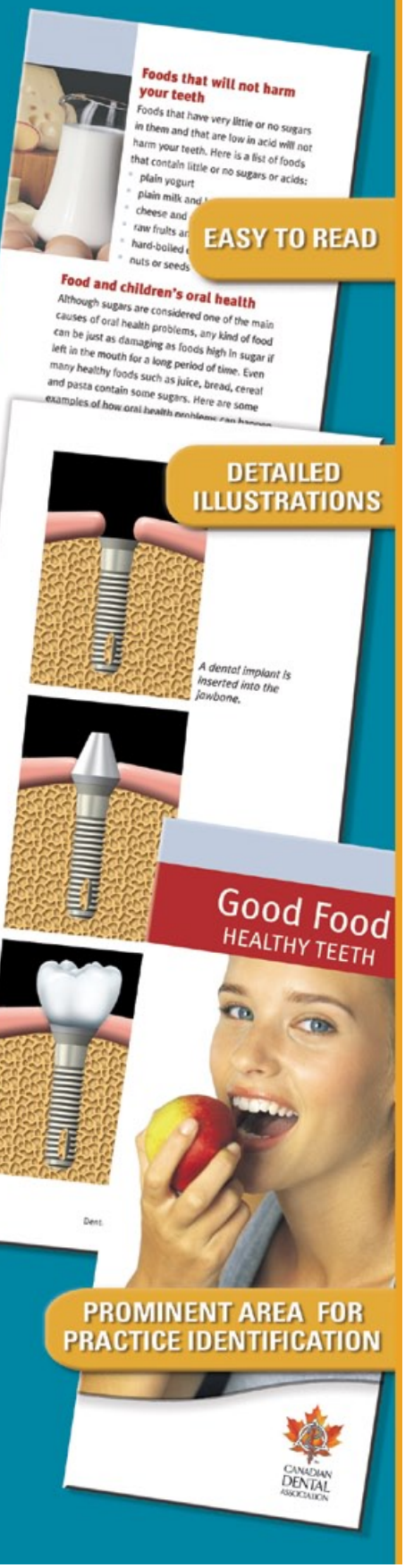

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2. **Bridges and Dentures – Replacing Missing Teeth** (12 pages)
   The benefits of replacing lost or badly damaged teeth. Traditional, implant, resin-bonded and cantilever bridges. Partial, complete, immediate, and conventional dentures and overdentures. Caring for bridges and dentures.

3. **Care After Minor Oral Surgery** (8 pages)
   The importance of oral care after oral surgery. What to do for bleeding, swelling, and soreness after minor oral surgery.

4. **Caring for Your Teeth and Gums** (8 pages)
   The importance of proper brushing and flossing to prevent tooth decay and gum disease. Brushing and flossing techniques and tips.

5. **Crowns – Restoring Damaged Teeth** (8 pages)
   The benefits of restoring the shape, appearance and function of damaged teeth. When a crown may be needed. Metal, composite, porcelain and porcelain-fused-to-metal crowns.

6. **Dental Implants – Replacing Missing Teeth** (8 pages)
   The benefits of dental implants as an alternative to bridges or dentures. Replacing missing roots to support one or more artificial replacement teeth. Who is a good candidate for implants. How implants are done. Caring for dental implants.

7. **Dental Safety and Emergencies** (8 pages)
   The importance of preventing dental injuries for good oral health. Simple precautions to avoid common dental injuries. Mouthguards. What to do for common dental accidents. The importance of following up with your dentist.

8. **Dental X-rays** (8 pages)
   The importance of dental x-rays to see the internal structure of the teeth and bones. What dental x-rays are and how they work. Dental X-ray safety. X-rays and pregnancy. Digital x-rays.

9. **Do I Need a Dental Checkup?** (8 pages)
   The importance of regular dental checkups at all ages. What to expect during a dental checkup. Dental anxiety. Early signs of oral health problems. Members of the dental care team.

10. **Early Childhood Tooth Decay** (8 pages)
    The importance of healthy first teeth. Why early childhood tooth decay is a serious disease and how it develops. Early warning signs. Prevention tips.

Build Patient Confidence and Trust

11. Good Food, Healthy Teeth (12 pages)
The importance of healthy foods for good oral health. How sugars cause cavities. Acids in foods and dental erosion. Protecting teeth from tooth decay and dental erosion.

12. Gum Disease — Preventing Tooth Loss (8 pages)
The importance of regular visits to the dentist to detect signs of gum disease. Gingivitis and periodontitis. Prevention and treatment. Non-surgical treatments - scaling, root planning, medication. Surgical procedures – pocket reduction, bone and soft tissue grafts, tissue regeneration.

13. Hidden Threats to Your Oral Health (8 pages)
Early warning signs of gum disease, oral cancer and other oral health problems. The importance of regular dental checkups to detect oral health problems early.

14. Oral Health — Good for Life™ (8 pages)
The importance of a healthy mouth as part of a healthy body. CDA's 5 steps to good oral health. Good oral hygiene habits. Healthy diet. Early warning signs of oral health problems. Tobacco cessation. The importance of regular visits to the dentist.

15. Orthodontics at Any Age (12 pages)
The importance of properly aligned teeth for good overall health at any age. The benefits of orthodontic treatment. Types of malocclusions and treatments available. Getting and caring for braces. Headgear. Removable appliances. Retainers. Oral surgery.

16. Root Canal Treatment (12 pages)
The importance of keeping natural teeth. The benefits of root canal treatment. Why patients may need root canal treatment. Tooth restoration after treatment. Retreatment and surgery.

17. Seniors and Oral Health (20 pages)
The importance of regular dental checkups for seniors. Parts of the checkup. Proper cleaning techniques for natural teeth, dentures, dental implants and bridges. Prevention and treatment of gum diseases. Tips for caregivers.

18. TMD (Temporomandibular Joint Disorder) (8 pages)
The symptoms, causes and treatment of TMD. The role of the dentist in treating TMD.

19. Tooth Decay, Cavities and Fillings (12 pages)
Causes and prevention of tooth decay. Stages of tooth decay. Types of cavities. Types of fillings and materials used. Computers, lasers and air abrasion in dentistry.

20. Your Child's Oral Health (Newborn to 12 years) (24 pages)
The importance of a good oral health routine with your child. Caring for your child 's teeth. Early childhood tooth decay. Cavities and fillings in primary teeth. Proper cleaning techniques for babies, toddlers and school-aged children. Tooth eruption and "fall out" charts. Common dental accidents and what to do. The importance of regular visits to the dentist. And much more.

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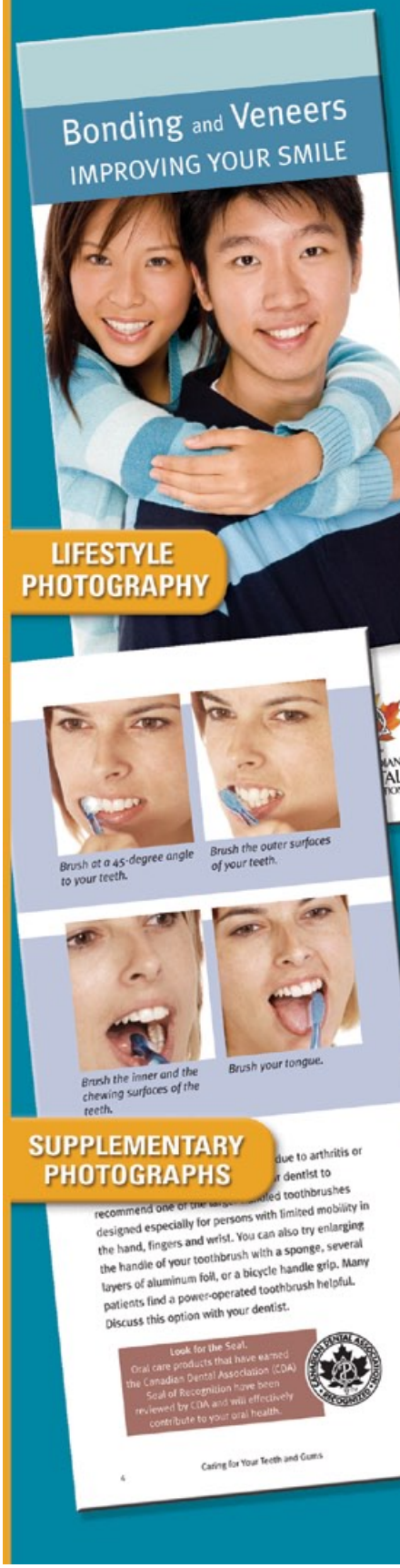

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What about this young girl?
Ilea, a 15-year-old girl from Manitoba, was seen by a dentist at a local Children's Hospital Clinic. Ilea was receiving medication for depression and obsessive behaviour patterns. She was also being followed by an Eating Disorders Clinic as an outpatient and by psychiatry. Ilea's obsessive behaviour included sleeping with cough candies in her mouth. This resulted in generalized cervical caries of almost all her posterior and mandibular anterior teeth. Through the course of previous dental treatment, Ilea's dental anxiety was significant, so much so that any new treatment was going to have to be carried out under general anesthesia. Ilea required permanent stainless steel crowns, composites and extractions due to carious pulp exposures. Unfortunately, due to Ilea's illness, her mother was unable to continue working, and her father's workplace did not provide any dental benefits, which created financial difficulties for Ilea to access dental care. That's when Ilea's dentist stepped in and applied to DCF for financial assistance from its Humanitarian Fund.

These examples illustrate how your donation to the Oral Health — Good for Life ™ Campaign will help others just like Bernice and Ilea.

In the 2006/07 fiscal year, DCF received 20 similar requests for public outreach grants totalling over $38,000. Unfortunately, due to limited resources, DCF was only able to fund six cases or $8,200 worth of fee for service treatment.

The goal of DCF's Oral Health — Good for Life ™ Campaign is to raise $10 million over five years, and in doing so, will provide an annual investment of $500,000+ into dental research, education and public outreach.

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Research Revolution at McGill University's Faculty of Dentistry

In 1991, McGill University announced that it would be shutting down its faculty of dentistry. While no one doubted the quality of education provided by the faculty, the university was asserting itself as a research-intensive institution. Although a small handful of excellent investigators were still active, the faculty of dentistry produced relatively little research overall. But thanks to a concerted and very public effort by faculty members and supporters, the faculty of dentistry at McGill University was saved. In 2008, the faculty is still here, but with a major difference.

"Today, we're at the point where our research is among the best for any dental school anywhere, based on widely accepted research metrics," says Dr. Marc McKee, the faculty's associate dean of research. "We have a very small faculty, but if you count on a per capita basis grant dollars, publications, salary awards, national and international leadership positions, prizes and research awards, we most certainly rank among the top dental schools in the world."

At the Forefront of Research

The transformation has been stunning. In 2006–07, projects on which McGill faculty of dentistry researchers were lead or co-investigators received almost $9 million in funding; when salaries and student support are included, support for research surpassed $13 million (compared to less than $1 million in 1998–99). Since 2005, over 100 publications per year have listed McGill dentistry in the author affiliations, more than double the total in 2001. In addition, the faculty's operating grants and contracts grew from 33 to 67 between 2001–02 and 2006–07, and its graduate student population has also doubled since 2000. This explosion of activity has propelled McGill's faculty of dentistry to prominence on the Canadian and international research scenes, even without the per capita proviso. About one-third of all funded oral health-related research in Canada is carried out at McGill, despite being home to only 5% of Canada's dentistry professors.

Over the past 10 years, because of retirements and university growth in certain areas demanding faculty renewal, and with the assistance of the Canada Research Chairs program, the faculty has hired 15 new tenure-track professors with active research programs. Both established researchers and rising young stars have been recruited from across Canada, the United States and Europe.

Establishing Research Priorities and Partnerships

The research is paying off with some major breakthroughs. For instance, Dr. Jake Barralet's work developing novel bioceramics and processing methods for bone grafts could change the way craniofacial and other osseous reconstructive surgery is carried out. Dr. Marc McKee's recent research on molecular determinants of calcification of bones and teeth, with applications to limiting debilitating pathologic calcification of soft tissues such as arteries in atherosclerosis, has been widely reported. Dr. Jocelyne Feine's research showing the health benefits of overdentures supported by 2 implants has also had a significant impact in the oral health field.

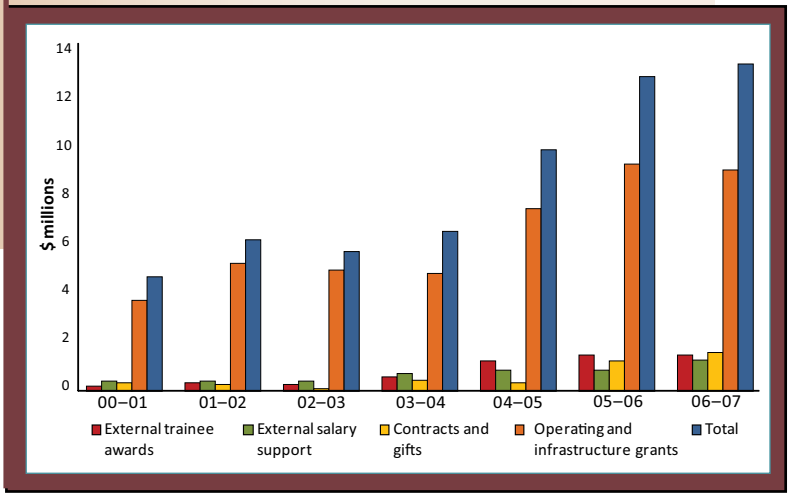
These successes, among others, can be attributed to a number of factors, including a set of research priorities that address some of the most compelling questions in dentistry today. Under the guidance of Dr. James Lund, former dean of dentistry, the

> "WE'RE GETTING RESEARCHERS TO SPEAK TO STUDENTS AND DENTISTS ABOUT THE IMPLICATIONS AND CLINICAL POTENTIAL OF THEIR WORK, AND THERE IS A LOT OF ENTHUSIASM AROUND THESE DISCUSSIONS. THE MORE ALL THESE GROUPS TALK TOGETHER, THE BETTER IT IS FOR EVERYONE."
>
> *Dr. Marc McKee, associate dean of research*

faculty has built 4 pillars of research: 1) clinical and health services, 2) pain and the neurosciences, 3) biomaterials, nanobiotechnology and tissue engineering, and 4) mineralized tissues and extracellular matrix biology. Each area is associated with one or more research networks or centres, so that professors and their teams of post-doctoral fellows and graduate students can draw on the university's wide-ranging expertise for interdisciplinary research that investigates the health care challenges facing dentists and their patients. Teams of like-minded, energetic and innovative senior and junior researchers focus their research efforts in an interdisciplinary way that is strongly supported by the new dean of dentistry Dr. Paul Allison, former dean Dr. Lund, by the deans of other faculties and by McGill's central administration.

Examples of this synergy are seen in the various collaborations facilitated by McGill's research centres of excellence, which bring together dentistry professors with colleagues in the faculties of medicine, science and engineering. For instance, McGill's researchers in oral health explore access to care, the causes of oral diseases and ways to improve oral health and quality of life, focusing in particular on infant caries, oral cancer, edentulism (especially prevalent among older residents of Quebec) and the relation of poverty to oral health. This involves collaborations with dentists, other health care professionals, government organizations and community-based groups, who work together at developing and testing ways to improve implant-supported dentures, address the needs of underprivileged populations, identify risk of caries in preschoolers and develop prevention strategies, and improve the quality of life and survival rates of patients with oral cancer. McGill's researchers are also involved with the Network of Oral and Bone Health Research, which joins over 50 researchers across Quebec. Similarly, the Alan Edwards Centre for Research on Pain, housed in the faculty of dentistry and directed by Dr. Catherine Bushnell, unites dentistry faculty with researchers from the faculties of medicine and science to explore the factors causing chronic pain, from physiological to environmental, dietary, genetic and psychological influences, and provide therapies to alleviate pain. McGill's pain research spans clinical and laboratory research and has achieved international renown. Today, it is recognized as one of the world's leading pain research units.

Biomaterials and tissue engineering researchers in dentistry are developing technologies and materials (often at the nano scale) to address problems of bone cementing or reconstruction, salivary gland regeneration, or bioactivation of implants, all of which address problems of diagnosis and treatment, provide early diagnosis of some diseases by detecting chemical changes, or provide new materials and regenerative strategies to treat patients and speed recovery times. Much of this work is carried out with scientists from the fields of medicine, science and engineering through multidisciplinary centres such as the McGill Centre for Biorecognition and Biosensors, the McGill Facility for Electron Microscopy Research and the McGill Institute for Advanced Materials. Finally, the faculty's mineralized tissues and extracellular matrix biology researchers investigate skeletal and dental biology in order to develop therapies to ensure healthy bones and teeth and understand and treat connective tissue disorders. Based primarily in the McGill Centre for Bone and Periodontal Research as part of the Jamson T.N. Wong laboratories, these researchers work closely with their peers in other faculties, as well as with members of the biomaterials research group.



Research stipends for graduate students, postdoctoral fellows and professors, as well as direct grant support for research. Additional income from the Canadian Foundation for Innovation and from large muti-investigator grants is not included.

Success Breeds Success

These research groups have evolved through gradual hiring processes, with 1 or 2 people becoming well-known in their fields and then attracting more top-flight

Dr. Marc McKee's recent research focuses on the molecular determinants of calcification of bones and teeth.

researchers interested in absorbing the vibrant intellectual environment. "Each of our 4 strengths has strong senior researchers with plenty of enthusiasm, as well as international reputations, and this in turn acts as a magnet for recruiting new, more junior academics," stresses Dr. McKee, who came to McGill in 1998. Dr. McKee is one of only a few to have received 2 Distinguished Scientist awards from the International Association for Dental Research for his research on biomineralization, bone remodeling and enamel maturation (the 1996 Young Investigator award and the 2003 Regulation of Biological Mineralization award). In addition, because interdisciplinary collaborations are so important to contemporary dental research, many recruits are joint-appointed with other faculties. Dr. McKee is joint-appointed in the faculties of dentistry and medicine (anatomy and cell biology), as are Drs. Gary Bennett (anesthesia), Catherine Bushnell (anesthesia), Fernando Cervero (anesthesia), Maryam Tabrizian (biomedical engineering), Dieter Reinhardt (anatomy and cell biology), Ji Zhang (neurology and neurosurgery) and Monzur Murshed (medicine).

Extending Knowledge Beyond the Scientific Community

While McGill's researchers are leaders in their fields, it remains important for them to make clear how their efforts will translate into enhanced treatment and improved oral health. "In general, researchers have not been very good at explaining the significance of their work to health professionals, to patients, to the media and to the public at large," Dr. McKee admits. "But at McGill we're learning to be interactive and proactive about implementing ways to translate this knowledge beyond just the scientific community."

The faculty is addressing this knowledge translation gap through everything from websites explaining research goals and health care objectives the researchers are striving to meet in the next 5 to 10 years, to newsletters explaining the latest breakthroughs.

In addition, the faculty's continuing education sessions now include a research component wherever possible. Recently, Dr. McKee participated in a session where he discussed how research on bone biology is translating into ways to help dentists determine if a patient is able to retain a dental implant. Other faculty members have done similar sessions, and this innovative proactive participation of investigators in the continuing education program ensures that recent key research findings are integrated into clinical updates for practising dentists.

Meanwhile, undergraduate dentistry students can participate in summer research programs and attend lectures on how to critically assess research literature, so that they will enter the profession with a better sense of the relationship between research and clinical practice, as well as an enhanced capacity to evaluate research claims and provide evidence-based care to their patients. The faculty is currently considering ways to include patients at scientific conferences so that problems can be discussed from the points of view of the patient, dentist and researcher.

"Some of our ideas are still in their infancy, but we're trying to find the best ways to educate the public, patients and dentists about what we do," says Dr. McKee. "We're getting researchers to speak to students and dentists about the implications and clinical potential of their work, and there is a lot of enthusiasm around these discussions. The more all these groups talk together, the better it is for everyone."

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More information on the research programs, objectives and publications of the faculty of dentistry at McGill University can be found online at www.mcgill.ca/dentistry/research.

Teaching Innovations at McGill Prepare Students for Real-World Clinical Setting

In the preclinical labs of McGill's faculty of dentistry, the tried-and-true is fused with the innovative, as dental manikins share space with work stations augmented by plasma screens and keypads. The high-tech equipment serves an important purpose, helping students acquire skills during the condensed preclinical session. This portion of the DMD program lasts for just under 6 months in the final half of the second year, before students enter their final 2 years of clinical training. The plasma screens, an initiative of prosthodontics instructor Dr. Samer Abi-Nader, allow professors to demonstrate procedures for all students to observe — not just a few sitting near the front of the lab. These procedures can then be displayed continuously as the students practise the techniques. The keypads make it easy for a professor to ask multiple-choice questions and receive real-time responses, providing an immediate snapshot of the students' comprehension of the material. Thus, professors know when they are free to move ahead and when they must linger over more confusing parts of the curriculum.

"As professors, we must always aim to be efficient because we have a very short preclinical session in which to train our students on the skills they need," explains Dr. Marie Dagenais, associate dean (academic). The time squeeze is partly a result of dentistry students spending the first 18 months of the DMD program studying alongside their peers in the faculty of medicine in McGill's "Basis of Medicine and Dentistry" biomedical science program. "We want our students to have a very good medical background so they can understand complex health problems and interact well with their colleagues," says Dr. Dagenais. "Interdisciplinary training is important because, to provide good patient care, people across the health care system have to collaborate. The dentist has a role in the global health of the patient and needs to develop rich professional relationships with medical colleagues, physical therapists, nurses and other professionals," she says.

Realistic Clinical Environment

Given the quick pace of the preclinical program, the move into clinical work can pose some challenges. To ease this transition, the faculty is also transforming the nature of its preclinical labs. "We want the laboratory environment to be as authentic as possible because the more realistic the lab is, the easier the transition to the clinic will be," says Dr. Dagenais. Consequently, the faculty is developing a simulation clinic that shares important characteristics with the real-world setting. "Right now, when students perform a procedure in the lab, it's just an exercise," she explains. "But if the preclinical lab is treated more like a true clinic, with students dressed in proper clinical attire, using correct charting techniques and treating their manikins like 'virtual patients,' it will help with the move into the actual clinic," she says. "By having the students begin charting in their second year, they will also have one less new skill to absorb when they enter the real clinic," adds Dr. Dagenais.

Another challenge for dental students is that they must learn about several different techniques simultaneously. For instance, they start preparing teeth for crowns early in the preclinical program, while also beginning work in orthodontics and removable prostheses. Normally, a flesh-and-blood patient presents a logical sequence for treatment, beginning with prevention, moving to cleaning and basic restoration, and then more complicated restoration, and finally, perhaps removable prostheses. "This logical progression is difficult for students to grasp when they learn the various procedures at the same time," says Dr. Dagenais. "However if they treat

> "WE WANT OUR GRADUATES TO BE VERY GOOD AT PROVIDING DIAGNOSES AND PLANNING TREATMENTS, SO WHEN THEY START TREATING PATIENTS, WE EMPHASIZE THE SKILLS INVOLVED IN CLINICAL DECISION-MAKING AND EVIDENCE-BASED DENTISTRY."
>
> *Dr. Marie Dagenais, associate dean of academic affairs*

the manikins like real patients, it helps create a learning context that is closer to reality." In terms of manual skills, Dr. Dagenais believes students can usually reproduce what professors ask them to. The real challenge is being able to translate the 'how-to' of a procedure into an understanding of the 'why.'

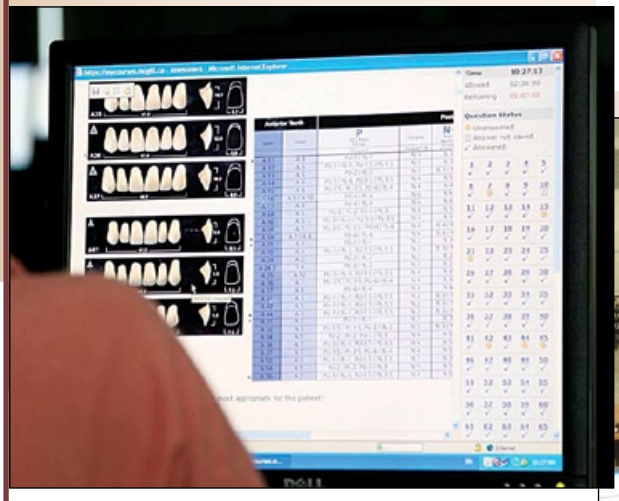
To fit all of the course material into the tight preclinical session, certain laboratory techniques must receive less emphasis. "Our philosophy is that we don't want our students spending valuable time learning lab procedures that they will likely not perform as dentists," Dr. Dagenais explains. For instance, McGill students no longer learn how to acrylize dentures or cast restorations, as most of these procedures are now performed by dental technicians. Since dentists will be interacting with technicians, students are given an overview of the processes and spend time evaluating the finished products.

Critical Decision-Making Skills

Once students move into the clinical training phase, a new set of pedagogical priorities arise. "We want our graduates to be very good at providing diagnoses and planning treatments, so when they start treating patients, we emphasize the skills involved in clinical decision-making and evidence-based dentistry," notes Dr. Dagenais. Students participate in seminars to discuss the treatment of patients and investigate the best available evidence for determining an effective treatment plan. Nurturing these skills also means that graduates will be better equipped to assess the myriad of new technologies and materials that are being introduced to the profession. "Dentists are always being approached by companies that want them to buy new products and they have to be able to use credible evidence to determine if one product is truly better than others," believes Dr. Dagenais. "We are teaching them to draw on the professional literature when making their choices."

Recently, Dr. Jean-Marc Retrouvey, director of the faculty's orthodontics program, developed a CD-ROM that facilitates the diagnosis of patients for orthodontics. Dr. Retrouvey's program helps students refine their diagnostic skills and has been integrated early in the clinical program. "Performing a treatment is a bit like following a recipe. If you are good, you can do it without much trouble. But you cannot perform a good treatment if the diagnosis is not right," explains Dr. Dagenais.

Dr. Retrouvey's CD-ROM is another example of the faculty taking advantage of new technologies to develop educational tools. "Of course, we are constantly evaluating these tools to determine their educational value," she says. "We're not interested in using technology for teaching just because we can. We are trying to find ways to make instruction more authentic as well as more efficient." Along these lines, computer-based examinations demonstrate the integration of advanced technology into the curriculum. "When I was a student, our exams were often multiple-choice," recalls Dr. Dagenais. "But when I examine my students in radiology, I can now display images



Third-year dental student taking an Objective Structured Clinical Examination — a performance-based testing method designed to measure clinical competence.

McGill's histology laboratory.

Students with Dr. James Lund at a white coat ceremony. The ceremony marks the students' transition from the preclinical classroom into patient clinics.

on the screen and ask them to comment. I have more flexibility in designing different question formats."

Well-Rounded Graduates

In addition to training students in the skills fundamental to the profession, McGill's undergraduate DMD program also stresses community outreach. "We want our graduates to be able to care for various populations that are underserved by the profession, so we have included the Community Clinics course in our program for several years," says Dr. Dagenais. The faculty is currently considering ways of expanding this element, perhaps by offering an elective program in which students could spend more time pursuing particular areas of interest. Undergraduates are also exposed to dentistry research, through coursework and optional summer research positions. "Despite the time crunch in the undergraduate program, almost one-third of our students become engaged in some form of research at one time or another," she says. The desire to learn is clearly addictive, as most McGill students continue to residency and many move into specialty programs after graduation. "We hope that by exposing our students to research we will interest more of them in pursuing academic careers," adds Dr. Dagenais. "Otherwise we're going to be facing a critical shortage of faculty members for dental schools."

Compared to other dental schools, the McGill program is relatively small, with graduating classes ranging between 30 and 35 students. But this small size has been advantageous for students and teachers alike. Professors quickly get to know the students, who in turn benefit from individual attention. With this level of intimacy, professors can identify the relative strengths and weaknesses of their pupils and are quick to help if a student is experiencing difficulties. In addition, small class sizes allow for adaptability and agility. "We are always changing the curriculum in response to needs in the profession, it's never exactly the same from one year to the next," notes Dr. Dagenais. The small class sizes, the early links with the medicine program, the use of new technologies, the clinical emphasis on decision-making and evidence-based dentistry and the strong research and outreach opportunities all make the McGill undergraduate program a modern and unique learning experience for its students

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McGill's Commitment to Dentistry Outreach: Transforming Delivery of Oral Health Care in Quebec

When *Access to Dental Care for Underprivileged People in Quebec* — a report sponsored by Quebec's Department of Health and Social Services — was released in spring 2004, it illuminated a pressing but often overlooked health care issue. The report investigated the challenges of ensuring oral health care for neglected and underprivileged communities in Quebec while also advocating the promotion of "an environment in which the provision of dental care for the underprivileged is seen as an important issue" by the dental profession.

These same concerns occupied participants at a 2-day colloquium in April 2006 (*Les voix d'accès — pour un meilleur accès aux soins dentaires pour les personnes défavorisées au Québec*) It brought together about 80 people, including oral health professionals, patients and representatives of organizations that provide services to Quebec's underprivileged population, as well as academics and government officials, to discuss barriers to accessibility — and ways to overcome them.

Both the report and the colloquium grew out of the McGill faculty of dentistry's commitment to improving oral health for people and communities with limited access to services. The report was the work of McGill dentistry professor Paul Allison, a public health researcher and the then director of Quebec's Network for Oral and Bone Health Research, along with Chris Allington and Judiann Stern, a student and a hygienist, respectively, in the faculty of dentistry. The follow-up colloquium was organized by a McGill committee that included Drs. Allison and Christophe Bedos.

Such efforts represent a central element of McGill dentistry's vision, as expressed in its mission statement, which asserts that the faculty "envisions a healthy and equitable society" and "is committed to the promotion of oral health and quality of life in the whole population, with emphasis on the needs of under-served communities and individuals." The statement goes on to emphasize the need "to enable oral health professionals to attain the highest levels of competence and commitment to patients and to the community," "to foster outstanding research, and to educate and nurture students in order to increase knowledge and improve the well-being of the population," "to serve the population through the delivery of oral health care in hospital facilities and through outreach programs in underprivileged communities" and "to maintain a leadership role in oral health education, in scientific research and in the shaping of public health policy, with an emphasis on reducing health inequalities." Although the latter 2 objectives explicitly stress community outreach and advocacy, all express a concern for community health and the importance of outreach, both to the professional community of dentists, through continuing education courses and other events, and to the broader community of patients.

> "When I went to school, community dentistry was just a lecture, but our students are getting a real slice of society. They're going to graduate from one of the best schools in North America and they'll make good incomes, so if we can impart some sense of social awareness at the same time, they receive a more complete education."
>
> *Dr. Bruce Dobby, McGill University dentistry professor*

Taking Dentistry to the Streets

In service to the patient community, McGill's outreach efforts involve both faculty members and students. On 19 occasions during the academic year, professors Bruce Dobby and Kwong Li set up mobile clinics across Montreal, then supervise students who provide free dental services to some of the city's most underprivileged people. The students are participating in a course, Dentistry 313: Community Clinics, but are also providing basic dental care — examinations, cleaning, fillings

and the like — to people who would otherwise tumble through the holes in Canada's dental health care system: street kids, homeless adults, impoverished senior citizens as well as young families struggling to get by and recent immigrants.

The program began in 1998, with a small cohort of dentists led by Dr. Michael Wiseman providing outreach services, and has since grown to become a mandatory course. By the time they graduate, each McGill dentistry student has participated in 8–10 mobile clinics.

"When I went to school, community dentistry was just a lecture," Dr. Dobby recalls. "But our students are getting a real slice of society. They're going to graduate from one of the best schools in North America and they'll make good incomes, so if we can impart some sense of social awareness at the same time, they receive a more complete education."

The clinics are coordinated with over 2 dozen referring agencies, including Le Bon Dieu dans la rue, which serves homeless youth, the Old Brewery Mission, Maimonides Geriatric Centre and the Montreal Chinese Hospital.

Outreach at Home and Abroad

The outreach program has won praise for its innovative efforts. In 2005, the Canadian Council for the Advancement of Education awarded it a silver medal for Best Outreach Program; in 2003, it won the Prix Qualité in partnership with Maimonides Geriatric Centre from the Quebec Association of Community Health Centres and residential and long-term care centres; and, in 2000, it received the Oral Health Promotion Award from the Canadian Dental Association.

But the program is not resting on these laurels. Currently, when patients need extractions or radiographs, they are referred to 1 of the outreach program's sessions at McGill's 40-seat student clinic at Montreal General Hospital, where dentistry students receive the bulk of their practical training. But sometimes these patients need even more complicated treatments, such as root canals or partial dentures, which currently lie outside the scope of the outreach clinics. This year, the program began to offer outreach patients access to complicated restorative dentistry treatments at the Montreal General clinics.

"It's a natural evolution," says Dobby. "We want to provide more complex services to the most vulnerable sectors of the community, who, under the current way in which dentistry is funded, have no way to get treatment."

The commitment to public service can carry professors far abroad. In February 2007, professors Véronique Benhamou and Gerard Melki led a team, including 3 fourth-year dentistry students, to Peru where, over 5 days in the remote community of Shanao, they treated 458 patients — carrying out over 2,540 procedures without running water, with electricity provided by a single generator and in temperatures that reached 35°C. The mission, which was sponsored by Kindness in Action, an organization that brings dental care to impoverished communities in Central and South America as well as Asia, reflects the level of interest that community outreach holds for McGill students and their professors.

Outreach clinic held at a community support centre for single mothers and their families in the Saint-Henri district of Montreal.

A Better Understanding of the Community

For some faculty members, outreach is an intrinsic part of their research. Dr. Christophe Bedos has developed connections with Quebec's main professional bodies, the Order of Dentists of Quebec (ODQ) and the Order of Dental Hygienists of Quebec (ODHQ), and with such anti-poverty groups as the Collectif pour un Québec sans pauvreté and ATD Quart Monde to explore the relations between dentists and patients on social assistance — relations that are often strained, as each side misinterprets the intentions of the other.

"The two worlds are often in conflict," says Dr. Bedos, whose research looks for ways to help bring them into harmony.

Ms. Fiona MacLeod; former dean James Lund; Mr. Michael Goldbloom, vice-principal of public affairs at McGill University; Ms. Heather Munroe-Bloom, McGill principal; Dr. Bruce Dobby and Mr. Len Bloom at an outreach clinic held at Le Bon Dieu dans la rue, a drop-in centre for street kids in Montreal's Hochelaga district.

"Dentists would like to help the patients, but do not understand their behaviours and believe they are not interested in their dental health; on the other side, welfare recipients sometimes think dentists are just money makers, thinking about their own interests."

Recently, he filmed interviews with people talking about their experiences of poverty, health and oral care. The end result was a DVD entitled *À l'écoute les uns des autres* (listening to one another). Available from the faculty of dentistry as of January 2008, the video will serve as a teaching and consciousness-raising tool.

"The DVD is aimed at changing misunderstandings between dentists and patients. When you hear people talking about their lives, you start to understand their situations," Bedos explains. "The next step is to use the knowledge we've gained in this process. We would like to offer professionals access to these videos, so we're developing ways to use the DVD in continuing education programs. And we would also like to implement the teaching of these issues in schools."

Cross-cultural issues are also important. Recently, Dr. Bedos and one of his master's students, Ms. Mei Dong, studied perceptions of oral illness among Chinese immigrants in Montreal and demonstrated the extent to which western and traditional notions coexist or interact for these patients. Their study concludes that dental professionals need to develop an understanding of acculturation processes and the ways in which oral health care is understood by immigrant communities if they are to provide "culturally competent care" and, thus, win the confidence of these patients. Similarly, Dr. Jacques Véronneau, who has also worked with immigrant groups in Montreal, is currently involved in a project with the Cree Nation focusing on the prevention of early childhood caries in the James Bay region, a project which also involves assessing community attitudes and beliefs regarding oral health care.

McGill's commitment to community outreach is already transforming the way oral health care is delivered in Quebec. After the 2006 colloquium, Dr. Paul Allison formed an ad hoc committee with representatives of the ODQ and the ODHQ, which then submitted a plan to the Department of Health and Social Services, recommending a set of initiatives in education, service provision and advocacy, along with the hiring of a coordinator to bring these ideas to fruition. So far, the government has not acted on the recommendations, but the ODQ has begun to explore ways to improve access to services for the elderly and the ODHQ has been working with advocacy groups to enhance services for people with disabilities.

"Promoting access to dental care is an important part of fighting poverty and inequality," Dr. Bedos stresses. "I don't think it's too strong to say that it is part of social justice."

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Robert David, *DDS*

"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. If you would like to contribute to this section, contact editor-in-chief Dr. John O'Keefe at jokeefe@cda-adc.ca.

The preparation of esthetically appealing and anatomically correct implant-supported provisional restorations facilitates fabrication of the final implant-supported crown. The provisional restoration is used to mould and manipulate the soft tissue and acts as a blueprint or template for the final crown (**Fig. 1**).[1,2,3] This type of restoration should be placed several weeks before the final impression is taken, to allow for maturation of the peri-implant tissue.

My preferred method involves chairside fabrication of a fixed provisional restoration using an acrylic denture tooth affixed to a screw-retained temporary cylinder. The acrylic denture tooth is attached to the temporary cylinder with autopolymerizing acrylic, which is then retained to the implant fixture with a screw.

The following technique provides an esthetic, functional and stable provisional restoration.

Details of the Procedure

1) Remove the healing abutment and immediately replace it with a screw-retained temporary cylinder (**Fig. 2**). Any delay may result in collapse of the gingival tissue over the fixture platform, which will make it difficult to seat the temporary cylinder.

2) Adjust the cylinder by reducing its length enough to allow the teeth to meet in centric occlusion.

3) Roughen the cylinder surface to enhance adhesion of the acrylic (**Fig. 3**), and then seal the lingual screw hole with boxing wax to protect the screw from the autopolymerizing acrylic that will be used (**Fig. 4**).

4) Select an appropriate acrylic denture tooth with matching shade, colour and form. Reduce the lingual surface of the acrylic denture tooth, keeping the labial veneer intact (**Fig. 5**). The lingual surface should be concave and should fit around the temporary cylinder with the labial

Figure 1: Patient's appearance before removal of tooth, grafting and placement of implant fixture.

Figure 2: The temporary cylinder has been screwed to the implant fixture.

Figure 3: The temporary cylinder has been adjusted into occlusion and the surface roughened to enhance adhesion of the acrylic.

Figure 4: The access hole for the lingual screw has been sealed with red boxing wax to protect the abutment screw from the acrylic to be used.

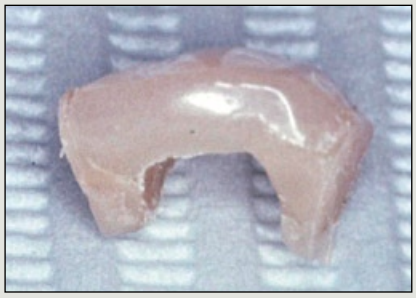

Figure 5: The lingual surface of the acrylic denture tooth is hollowed to fit around a temporary cylinder; the labial surface of the veneer remains intact.

Figure 6: The labial veneer of the acrylic denture tooth is fitted around a temporary cylinder in preparation for fastening to the cylinder with autopolymerizing acrylic.

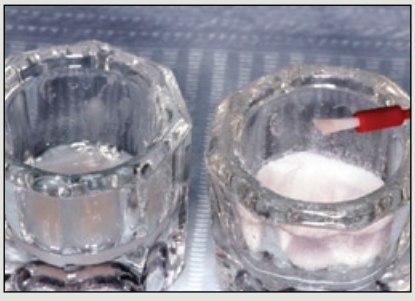

Figure 7: Acrylic monomer and polymer are applied with a brush technique.

Figure 8: The labial veneer of the acrylic denture tooth is attached to the temporary cylinder with autopolymerizing acrylic, which is then allowed to set.

surface in reasonably good esthetic orientation (**Fig. 6**).

5) Position the labial veneer of the shaped acrylic denture tooth around the seated temporary cylinder and then fasten it to the temporary cylinder with autopolymerizing acrylic using a brush technique (**Figs. 7** and **8**).

6) Remove the temporary cylinder with the attached labial veneer surface from the fixture platform and immediately replace it with a conventional healing abutment (**Fig. 9**).

7) Complete the fabrication of the desired final tooth form by adding and shaping the autopolymerizing acrylic. The acrylic provisional restoration will need to be tried in and adjusted a few times to achieve the desired shape; polishing will then be required (**Fig. 10**).

By varying the subgingival contour of the provisional restoration, the peri-implant gingival tissue may be moulded and manipulated. On the labial surface of the provisional restoration, the more convex the subgingival contour, the further the gingival tissue may be moved in the apical direction. Conversely, the less convex or flatter the subgingival surface, the more the tissue may be moved in the coronal direction. The papilla may be moved incisally by making the subgingival interproximal acrylic contour more convex, which pushes the tissue toward the proximal surface of the adjacent tooth and moves it incisally (within reason, taking biologic constraints into account). Proceed with caution, as too great a pressure will restrict the vascular supply to the papillary tissue and cause necrosis. Adjust the tooth contour and form to establish appropriate esthetics, occlusion and soft-tissue support.

The soft tissue, both on the ridge and on the adjacent structures, will play a role in how much tissue moulding and manipulation are possible.[4,5]

Figure 9: The labial veneer of the acrylic denture tooth has been luted intraorally to the temporary cylinder; it is then removed for completion of the anatomic form.

Figure 10: Labial view of the contoured, finished and polished provisional restoration.

Figure 11: Lingual view of the provisional restoration affixed to the implant fixture with an abutment screw.

Figure 12: The provisional restoration is checked 1 week after insertion.

Figure 13: Appearance of the final restoration 6 weeks after insertion.

Figure 14: Appearance of the final restoration 1 year after insertion.

At this stage, the health and esthetic appearance of the peri-implant tissues, the anatomy and form of the provisional restoration and occlusal issues are of great importance; the shade of the provisional is of lesser concern.

8) Insert the implant-supported provisional restoration and tighten the screw (**Fig. 11**). Then, cover the abutment screw with cotton pellets and seal the screw access hole with an easily removable temporary filling material.

9) One week later, verify the screw-retained provisional restoration for esthetics, form and function and the peri-implant tissues for health and contour, making adjustments if necessary (**Fig. 12**).

10) Upon optimal development of the peri-implant tissues, several weeks after insertion of the provisional restoration, take an impression for fabrication of the final restoration. A customized impression coping may be used to capture the contour of the subgingival peri-implant soft tissues. A diagnostic model of the provisional, secured to the fixture, is prepared and articulated with the counter-model. Photographs of the provisional, both in the patient's mouth and on the laboratory bench, are taken and sent with the models to the laboratory for fabrication of the final restoration. The diagnostic model and photographs will help the dental technologist in reproducing the form of the carefully crafted provisional restoration in the final crown. This technique should minimize the chairside adjustments required to the final restoration. Upon completion of the screw-retained crown, place it in the patient's mouth and follow the usual protocol for torqueing and sealing. Check the restoration for tissue health, occlusion and integration, and recheck at regular intervals (**Figs. 13** and **14**).

Conclusion

Placement of an esthetic and functional implant-supported provisional restoration facilitates fabrication of the final implant-supported crown. More chairside time is spent with the patient before taking the impression for the final restoration than after. The fixed provisional restoration enhances patient satisfaction and is financially advantageous. In some cases, this provisional restoration technique may be used before osseointegration of the fixture. The decision to apply immediate or early loading to an implant depends upon numerous factors, which are determined during treatment planning or at the time of surgical placement of the implant.[6,7]

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* Walters Kluwer, Health Canadian Dental Census – May 2008.

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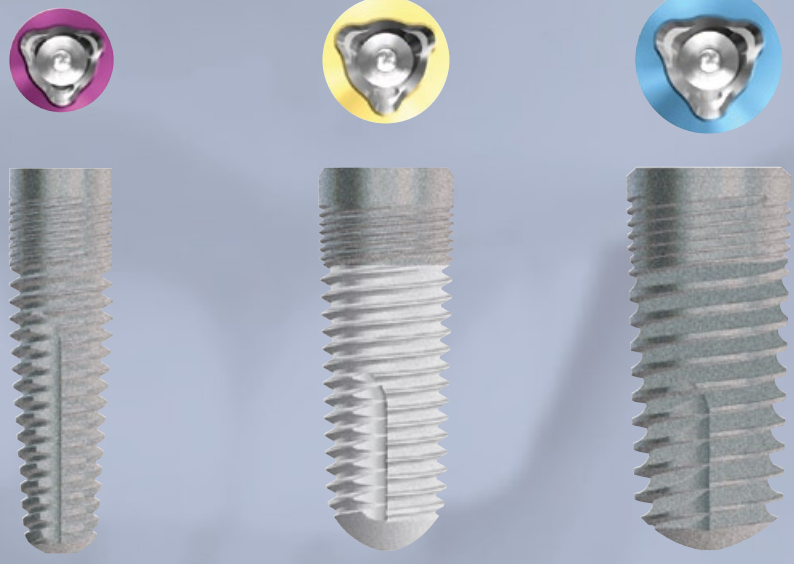

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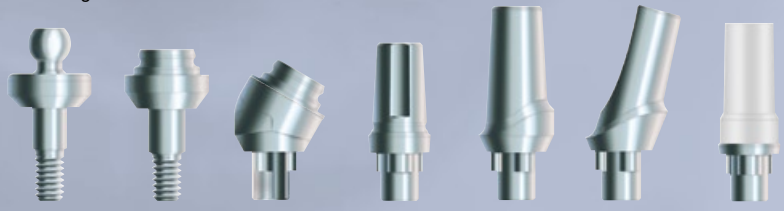

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The "Point of Care" section answers everyday clinical questions by providing practical information that aims to be useful at the point of patient care. The responses reflect the opinions of the contributors and do not purport to set forth standards of care or clinical practice guidelines. This month's contributors are from McGill University's faculty of dentistry.

McGill Faculty of Dentistry

QUESTION 1

What is the recommended dental management for patients who are receiving oral bisphosphonate therapy?

Background

By decreasing osteoclastic activity, bisphosphonate drugs decrease rates of bone resorption, resulting in an increase in bone mass when given to patients with osteoporosis. They also have therapeutic effects for patients with rarer metabolic bone diseases such as Paget's disease and osteogenesis imperfecta and for cancer patients with metastases to bone. Two forms of bisphosphonate treatment are currently available — oral (**Table 1**) and intravenous (see article on p. 618). Most patients receiving bisphosphonate therapy who are encountered in the general dental setting are receiving oral treatment, usually for osteoporosis.

Management Advice

It has been hypothesized, though not proven, that oral bisphosphonate therapy may be associated with osteonecrosis of the jaw. The scientific data for cases of bisphosphonate-related osteonecrosis of the jaw (BRONJ) are incomplete, and the vast majority of patients receiving oral bisphosphonate therapy do not experience any oral complications.[2] As such, patients should be informed that the health benefits of oral bisphosphonate therapy far outweigh the minimal risk (if any) of BRONJ. In addition, good oral hygiene, accompanied by regular dental care, is the best way to minimize this risk, if it exists. Patients receiving bisphosphonate therapy should be advised to contact their dentist if any problem develops in the oral cavity. In general, patients who are taking oral bisphosphonates without other risk factors (**Box 1**) can be treated according to normal protocols and procedures, including surgery.

For patients receiving oral bisphosphonate therapy, dental treatment recommendations are similar to those for patients not taking the medication, as described in the following sections.

Restorative and Prosthetic Dentistry

All restorative procedures may be performed. At present, there is no evidence that malocclusion or occlusal forces increase the risk of BRONJ. Prosthodontic appliances should be adjusted for fit to avoid mucosal irritation.[2]

Periodontal Diseases

Treatment protocols are similar to those for the general population (i.e., patients not taking the medication).[2]

Table 1 Bisphosphonates currently available in Canada for oral administration[1]

Generic name	Brand name	Indications
Alendronate	Fosamax	Osteoporosis, Paget's disease
	Fosavance	Osteoporosis
Clodronate	Bonefos, Clasteon	Bone metastases of malignant tumours, hypercalcemia of malignancy
Etidronate	Didrocal	Osteoporosis
	Didronel	Paget's disease
Risedronate	Actonel	Osteoporosis, Paget's disease of bone
	Actonel Plus Calcium	Osteoporosis

Box 1 Risk factors for bisphosphonate-related osteonecrosis of the jaw in patients receiving oral bisphosphonate therapy[2,3]

- Concomitant use of estrogen or glucocorticoids
- Comorbid conditions (e.g., malignancy)
- Poorly fitting dental appliances
- Intraoral trauma
- Presence of tori or other bony exostoses
- Pre-existing dental or periodontal disease
- Older age (> 65 years)
- Alcohol and/or tobacco use

Oral and Maxillofacial Surgery

Treatment protocols are similar to those for the general population (i.e., patients not taking the medication), unless other risk factors are present (**Box 1**). In such cases, conservative surgical technique, with primary tissue closure, should be considered when extractions or surgery are necessary (including elective dentoalveolar surgical procedures such as implant placement, reduction of tori or extraction of asymptomatic teeth).[2]

Patients may use a chlorhexidine-containing rinse immediately before and after surgical procedures. Systemic antibiotic therapy may be considered for perioperative prophylaxis or if there is evidence of infection.

Endodontics

If the tooth is salvageable, endodontic treatment is preferred to extractions or surgical manipulation. If extractions or surgical manipulations are necessary, such procedures should follow the recommendations discussed in the section "Oral and Maxillofacial Surgery" above.

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QUESTION 2

What is the recommended dental management for patients who are receiving intravenous bisphosphonate therapy?

Background

Since 2003, dentists have been observing osteonecrosis of the jaw as a potential complication of intravenously administered bisphosphonate therapy. Bisphosphonate-related osteonecrosis of the jaw (BRONJ) is defined as an area of exposed bone in the maxillofacial region that does not heal within 8 weeks after its identification by a health care provider, in a patient who is receiving or has previously been receiving bisphosphonates and who has not had radiation therapy to the craniofacial region.[1]

The bisphosphonates currently available on the Canadian market for intravenous (IV) administration are listed in **Table 1**.[2]

Management Advice

Dental Management of Patients Receiving IV Bisphosphonate Therapy

The risk of BRONJ appears to range between 1% and 10% in patients receiving IV bisphosphonate treatment.[1] Any patient receiving such therapy should be informed of the signs and symptoms of BRONJ. In addition, before the IV bisphosphonate therapy is started, the patient should undergo a dental evaluation by a qualified dental professional, and dental recall examinations should be performed throughout the course of bisphosphonate therapy. The frequency of such examinations will be dictated by the patient's clinical and dental status.

It is also important to identify patients with risk factors for BRONJ: dental extraction and/or oral bone surgery; poorly fitting dental appliances; intraoral trauma; presence of tori or other bony exostoses; pre-existing dental or periodontal disease; older age (> 65 years); prolonged exposure to bisphosphonate therapy; concomitant use of estrogen or glucocorticoids; comorbid conditions (e.g., malignancy); alcohol and/or tobacco use.[1]

Patients with cancer who are receiving IV pamidronate and/or zoledronic acid are at the greatest risk for BRONJ.[1]

If the patient's situation permits, invasive dental procedures should be performed before the IV bisphosphonate therapy is started, with follow-up at 14–21 days to ensure complete healing at the surgical site. The following sections outline treatment recommendations for patients who are already receiving IV bisphosphonate therapy.[1,3]

Restorative and Prosthetic Dentistry

All restorative procedures may be performed. At present, there is no evidence that malocclusion or occlusal forces increase the risk of BRONJ. Prosthodontic appliances should be adjusted for fit to avoid mucosal irritation.

Periodontal Diseases

Nonsurgical therapy is preferred (such as scaling and root planing). Periodontal surgery is not recommended. When necessary, surgical treatment should be aimed primarily at obtaining access to root surfaces.

Oral and Maxillofacial Surgery

Whenever possible, nonsurgical endodontic or periodontal therapy is preferred to extraction, unless there is a risk of aspiration. Elective dento-alveolar surgical procedures, such as implant placement, reduction of tori and extraction of asymptomatic teeth, should be avoided. When an extraction or surgery is necessary, conservative surgical technique, with primary tissue closure, should be considered. The greater incidence of BRONJ in the mandible than the maxilla, especially in the posterior region of the mouth, must be taken into account in the decision to perform surgery.

Endodontics

For salvageable teeth, endodontic treatment is preferred to extractions or surgical manipulation. Manipulation beyond the apex should be avoided. Surgical procedures should be guided using the same recommendations mentioned in the section "Oral and Maxillofacial Surgery."

Considerations for Any Surgical Procedure

Patients should use a chlorhexidine-containing rinse immediately before and after surgical procedures. Systemic antibiotic therapy may be considered for perioperative prophylaxis or if there is evidence of infection (and should follow the guidelines of the American Dental Association[3]) (**Table 2**).

Table 1 Bisphosphonates currently available in Canada for intravenous administration[2]

Generic name	Brand name	Indications
Clodronate	Bonefos, Clasteon	Bone metastases of malignant tumours, hypercalcemia of malignancy
Pamidronate	Aredia	Bone metastases of malignant tumours, hypercalcemia of malignancy, multiple myeloma, Paget's disease
Zoledronic acid	Aclasta	Paget's disease
	Zometa concentrate	Bone metastases of malignant tumours, hypercalcemia of malignancy, multiple myeloma

Table 2 Proposed antibiotic therapy[3]

Patient's penicillin status	Suggested antibiotic	Oral regimen
Not allergic to penicillin	Amoxicillin	500 mg t.i.d. for 14 days
	May be combined with metronidazole	250 mg t.i.d. for 14 days
Allergic to penicillin	Clindamycin	300 mg t.i.d. for 14 days
	Azithromycin	250 mg t.i.d. for 10 days

Figure 1: A 69-year-old man with necrotic bone and no healing 3 months after extraction of a tooth. The patient had prostate cancer and was receiving zoledronic acid. Photo courtesy of Drs. Emery and Pompura.

Dental Management of Patients with BRONJ

If BRONJ is suspected but not yet confirmed (e.g., duration of unhealed exposed bone less than 8 weeks; **Fig. 1**), the patient should be followed carefully. Additional common findings include pain, swelling, paresthesia, suppuration, soft-tissue ulceration, intraoral or extraoral sinus tracks, and loosening of teeth. Radiographic findings can vary from changes in bone density to no obvious alteration to the bone pattern.

The differential diagnosis for BRONJ includes gingivitis, periodontal diseases (e.g., necrotizing ulcerative periodontitis), osteomyelitis, sinusitis, temporomandibular disorder, trauma, periapical lesions, osteoradionecrosis, bone tumours and metastasic lesions.

Standard radiography such as panoramic and periapical radiography may help in the detection of BRONJ in the early stages. Computed tomography may also be considered. No imaging is required for patients with established clinical evidence of BRONJ.

The dental professional should alert the patient's physician to the diagnosis and should report cases of BRONJ to the appropriate agencies, such as the manufacturer of any agent implicated. There is no published evidence to suggest that discontinuation of bisphosphonates will promote resolution of BRONJ.

If pain is present, it should be managed appropriately with nonsteroidal anti-inflammatory drugs or narcotic analgesics. The patient should be advised to use chlorhexidine (0.12%) or another similar oral antimicrobial rinse, and systemic antibiotic therapy may be prescribed if there is evidence of secondary infection. Establishing and maintaining good oral hygiene is essential.

Any patient with established BRONJ needing surgical procedures should be referred to an oral and maxillofacial surgeon, who may consult other qualified specialists as appropriate. Any dentoalveolar surgical procedure (i.e., extractions, implants or apical surgery) should be avoided since the surgical sites will likely result in additional areas of exposed necrotic bone. However, loose teeth should be removed from the exposed bone if there is a danger of aspiration. Similarly, loose segments of bony sequestra should be removed, but without exposing uninvolved bone. Sharp bone edges should be removed, to prevent trauma to the adjacent soft tissues. Segmental jaw resection may be required for symptomatic patients with large segments of necrotic bone or pathologic fracture.

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Further Reading

Advisory Task Force on Bisphosphonate-Related Osteonecrosis of the Jaws, American Association of Oral and Maxillofacial Surgeons. American Association of Oral and Maxillofacial Surgeons position paper on bisphosphonate-related osteonecrosis of the jaws. *J Oral Maxillofac Surg* 2007; 65(3):369–76.

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A patient brochure on bisphosphonates produced by McGill University's faculty of dentistry is available online at www.cda-adc.ca/jcda/vol-74/issue-7/617.html.

QUESTION 3

Which digital intraoral sensor is better?

Background

There are 2 types of intraoral sensors: direct sensors and storage phosphor sensors. Direct sensors, whether they use charge-couple-device or complementary metal oxide semiconductor technology, are equivalent in terms of image quality.[1] Image display is instantaneous as these sensors are connected to a computer. The storage phosphor sensor is a plate, with dimensions comparable to those of conventional film; images are obtained when the plate is inserted into and read by a scanner.

Several experts believe that today's sensors are reaching their technological limits. Both direct and storage phosphor sensors are capable of producing diagnostic images for the tasks dentists perform daily, such as diagnosing caries, identifying periapical lesions and evaluating periodontal bone loss (**Figs. 1–4**).[2–7]

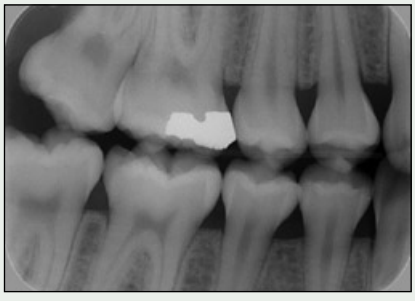

Figure 1: Interproximal image taken with a storage phosphor sensor.

Figure 2: Periapical image taken with a storage phosphor sensor.

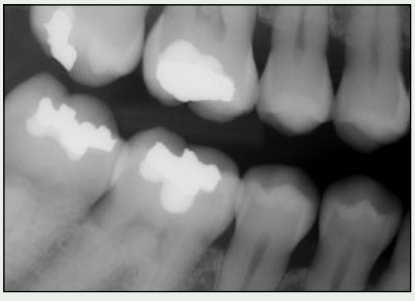

Figure 3: Interproximal image taken with a direct sensor.

Figure 4: Periapical image taken with a direct sensor.

Digital Sensor Characteristics

The characteristics of digital sensors that have an impact on image quality are contrast resolution, spatial resolution, latitude and sensitivity.

Contrast resolution is the ability to detect differences between shades of grey. Theoretically, a sensor capable of capturing more shades of grey (greater bit depth) is better. However, because computer monitors display only 8-bit images, in practice there will be no difference between intraoral sensors that capture 8-bit images (256 levels of grey), 12-bit images (4,096 levels of grey) and 14-bit images (16,384 levels of grey).[8,9] In addition, the number of grey shades differentiated by the human eye is between 32 and 60.[10]

Spatial resolution is the ability to capture details and is measured in line-pairs per millimetre (lp/mm). Film achieves a resolution of up to 20 lp/mm. Newer sensors with a pixel size of 20 µm are able to resolve 25 lp/mm. Storage phosphor systems achieve a lower resolution than direct sensors. Most dentists can perceive 6 lp/mm and up to 10–12 lp/mm with magnification; images magnified above that become pixilated and non-diagnostic. Digital sensors available today have a resolution of 7 lp/mm or more.[11]

Latitude is the ability of digital receptors to provide diagnostic images

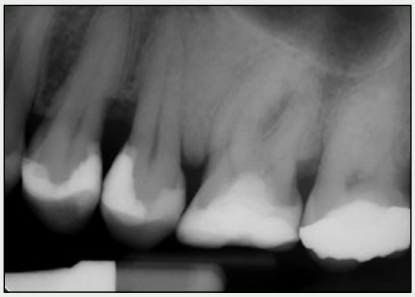

Figure 5: This image, taken with a direct sensor, doesn't show tooth apices.

Figure 6: From left: size 2 direct sensor, size 2 plate for a storage phosphor sensor and size 2 film.

Figure 7: Storage phosphor sensor plate that is scratched and damaged at the edges.

with a range of exposures. A disadvantage of conventional film is that it is easily overexposed or underexposed. Although the latitude of direct sensors is comparable to that of film, storage phosphor sensors have a greater latitude and, under normal conditions, images are unlikely to be overexposed or underexposed.[10] The downside is the greater dose of radiation that patients will receive if greater exposure is used consistently.[12]

Sensitivity is the amount of exposure required to produce an image. The more sensitive the receptor, the less exposure is required. One well-known advantage of intraoral digital radiography is the lower dose of radiation to which patients are exposed. The most sensitive intraoral film available is F-speed. Storage phosphor systems can produce images using half the exposure necessary with F-speed film. Direct systems require more exposure than storage phosphor systems, but less than F-speed film.

All imaging software products offer a range of tools for dentists to use to enhance their images. However, the goal is to acquire good-quality diagnostic images that require no enhancement, as modifying images may have deleterious effects.[13,14] Clear task-specific indications for the various enhancement tools have yet to be developed.

Management Advice

Direct Systems

Advantages

- Instantaneousness
- Additional images can be obtained without removing the sensor from the mouth
- Spatial resolution superior to storage phosphor

Disadvantages

- Sensors are expensive and fragile
- Physical properties of the sensor: thick, rigid, attached cable. Positioning devices are available for all direct sensors to allow the device to be placed parallel to the teeth. However, this technique is not always possible, particularly for patients with a narrow palate. Reverting to the bisecting technique is more frequent than with film. Missed apices are a common problem, particularly for new users of this technology (**Fig. 5**). The presence of the cable makes obtaining an image of vertical bitewings almost impossible.
- More than one size sensor will be needed. Most companies offer size 1 and 2 sensors whose active areas are smaller than their film counterparts. Some companies now offer a size 0 sensor for pediatric applications. Size 2 sensors are required for interproximal examinations to view the bone level, but obtaining a distal image of the canines with these large sensors is challenging (**Fig. 3**).
- More exposures are required compared with film because of the smaller active surface area of direct sensors and difficulties in positioning (**Fig. 6**).
- The learning curve is greater than with storage phosphor sensors.

Storage Phosphor Systems

Advantages

- Latitude superior to direct sensors and film
- Sensitivity superior to direct sensors and film
- Sensor thickness and flexibility are comparable to those of film
- Plates available in sizes 0 to 4
- Plates compatible with standard positioning devices for obtaining periapical, horizontal and vertical interproximal radiographs

- Transition from film to storage phosphor is simple

Disadvantages

- Spatial resolution inferior to that of direct sensors
- Scanning of exposed plates is required. Scanning time increases with the size and number of plates and required resolution
- Space for the scanner is required, preferably in a dimmed environment as exposed plates are sensitive to light
- With handling, plates become scratched and damaged at the edges (**Fig. 7**) and must be replaced regularly[15]

Lighting Requirements

The lighting conditions under which images are interpreted must be considered. Dental operatories are generally equipped with high ambient light; this must be reduced to create an environment suitable for analysis of digital images.[16] Adjusting the contrast and brightness of monitors will also improve image quality.[17] Cathode ray tube monitors tend to lose brightness with time.

Transition Period

Regardless of the system selected, expect a transition period to adapt to looking at digital images, which appear to have less detail. The evidence shows that the information needed to make common diagnoses is there. The medical profession adopted digital radiology to replace conventional plain films before the dental profession, possibly because radiologists were used to reading computed tomography and magnetic resonance imaging scans on monitors. However, as stated by Ludlow and Mol, "It is no longer a matter of *if* but rather *when* the majority of dental offices will use digital imaging."[11]

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QUESTION 4

Is the choice of attachment for implant overdentures influenced by the angulation of the implant?

Background

The treatment of edentulous patients with implant-retained or implant-supported removable prostheses yields satisfactory results in terms of both masticatory function and patient satisfaction. However, maintenance is a concern, especially during the first year of denture wear, regardless of the type of attachment (bar, magnets or stud). Some researchers have reported the need for frequent reactivation of loose components and replacement of fractured matrices and patrices.[1] Manufacturers recommend specific positioning and angulation of implants planned for overdentures to ensure predictable retention of the attachment and to prevent premature wear and fatigue, thereby reducing maintenance.

In determining implant angulation, an anatomic plane such as Camper's plane, the Frankfurt plane or the mandibular plane can be chosen as a reference.[2] The occlusal plane of the existing or planned prosthesis would also be an adequate reference for measuring the angulation of implants or planning their ultimate position.

It has been suggested that implants should be placed as parallel to the path of insertion of the overdenture and as perpendicular to its occlusal plane as possible. Positioning the implants in accordance with these references facilitates denture insertion and avoids excessive nonaxial loading.

Because of differences in the size and shape of the residual ridge and the maxillomandibular relation, ideal angulation of the implants during placement can be difficult or impossible to achieve. In a preliminary study,[3] 19% of the implants evaluated had an angulation of 90° to the reference plane, 11% had a lingual inclination and 70% were inclined labially. **Figure 1** illustrates divergent inclines with 2 implants.

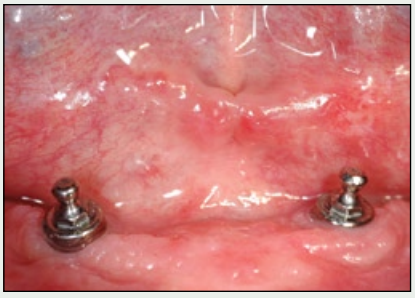

Figure 1: Excessive between-implant angulation is detectable during an intraoral inspection.

Figure 2: The angulation of the implants should also be evaluated in relation to the sagittal plane.

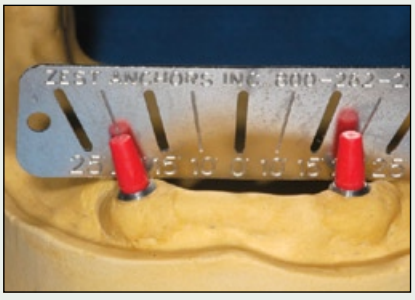

Figure 3: Implant angulation can also be assessed with the aid of plastic pin extensions and an angle measurement guide on a study cast. The implant on the right side had an inclination of about 20° projected on the frontal plane in relation to the residual ridge.

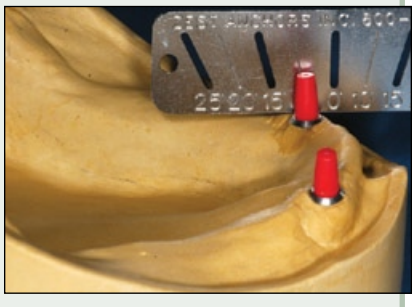

Figure 4: Assessment of implant angulations projected on the sagittal plane in the laboratory.

Other studies have shown that between-implant divergence or convergence of about 10° is technically manageable, but excessive wear of the attachments has been described with greater angulation. Labial inclination superior to 6.5° and lingual inclination superior to 6° in relation to the sagittal plane were associated with more repairs, whereas there was no difference in the incidence of adjustments or repairs associated with angulations projected on the frontal plane.[4] Treatment failure can also be related to mechanical weakness of the attachment system employed.

Assessing Implant Angulation

Intraoral Assessment

Plastic or metallic extension pins can be connected to the implants to allow angulation to be evaluated directly, with the implant in the patient's mouth. Angulation of the implants is then estimated by visually comparing the direction of the extension pins and standard marks on an instrument with preset angu-

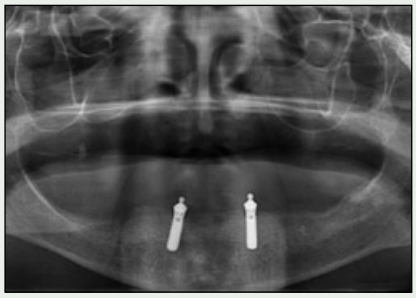

Figure 5: Moderate inclination of the right-side implant is evident in a frontal panoramic view.

Figure 6: Teleradiography of the same patient as depicted in Fig. 5 shows moderate discrepancy of the implant positions projected on the sagittal plane.

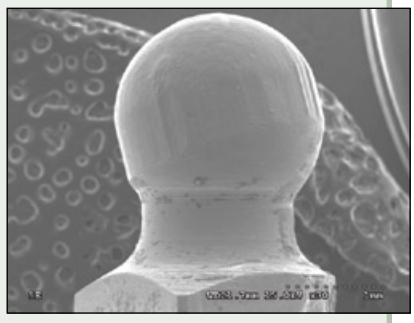

Figure 7: Electron micrograph shows that this ball attachment has become worn after 8 years in function. Note the position and direction of the worn surfaces, about 20° to the long axis of the attachment. (Original magnification ×30.)

lations. The device can be positioned on top of the residual ridge, behind the implants, or it can be aligned with the bipupilar plane. This manoeuvre is easy to perform when estimating angulations projected on the frontal plane but is more difficult for angulations on the sagittal plane because the cheeks and lips interfere (**Fig. 2**).

Laboratory Assessment

The device described above can also be used to estimate implant angulations on a dental cast, obtained by pouring an impression of the arch with dental stone (**Figs. 3** and **4**). Alternatively, a protractor can be used, which will yield a more accurate measurement of the angle.

Radiographic Assessment

Panoramic radiography (**Fig. 5**) and teleradiography (**Fig. 6**) permit evaluation of the direction of the implants relative to a reference plane, such as an anatomic or denture occlusal plane, and measurement of between-implant angulation.

Choice of Attachment System

When the location and alignment of the implants are adequate, the choice of attachments should be based on clinical criteria such as the degree of retention required, the number of implants and the available prosthetic space.

Minor Discrepancies in Between-Implant Angulation

In cases of minor or mild discrepancies in between-implant angulation, the following principles should be observed:

- The matrix parts of ball attachments should be oriented according to a common path of insertion for the individual abutments before the application of acrylic.
- Matrix components with special designs to tolerate between-implant angulation discrepancies are commonly available. Plastic parts with specific levels of resiliency, which are designed to tolerate divergence or convergence between implants of up to 40°, are available for some systems, particularly the cylindrical designs.

It should be emphasized that the amount of wear in cases of between-implant angulation discrepancies is directly related to the magnitude of the angle (**Fig. 7**).

Significant Discrepancies in Between-Implant Angulation

In cases of significant between-implant angulation discrepancies:

- For some systems, special attachment abutments are manufactured with different angulations to compensate for discrepancies. Some of these can be rotated before being tightened in

place, which adds flexibility in the search for an ideal attachment position.

- Magnet or bar attachments can be used in selected cases. For the magnetic type, lack of a mechanical engagement between matrix and patrix prevents problems related to implant angulation, providing a workable solution in even the most severe cases. However, less reliable retention and maintenance problems, such as wear of components and corrosion of the magnetic alloys, have been frequently reported as the main disadvantages of these systems. Bar-clip attachments are another option when angulation of implants is excessive. An adequate path of insertion and adequate retention for overdentures can be easily achieved by splinting the implants with a metallic bar, although this type of attachment usually requires more vertical and between-implant space. It also costs more, requires extra laboratory and chairside time, and is often more difficult for patients to clean than the stud type of attachment.

Conclusions

The angulation of dental implants can have a clinically relevant effect on the attachment system for implant overdentures. To prevent excessive wear of the attachment components, loss of retention, maintenance problems and unnecessary costs, the most effective system should be chosen after careful assessment of implant angulation.

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When it Comes to New Technologies, Are You Fulfilling Your Professional Mandate?

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It is no secret that the Canadian population is greying. While health care services have been rapidly adapting to accommodate this demographic shift, one wonders if the same can be said for dentistry. Has the dental profession modified its techniques or adapted new ones to cater to the changing needs of the aging population? Some would argue that the extensive studies conducted by university researchers and the aggressive development of new and improved products by dental manufacturers translate into better services and treatment options for the public. But are these efforts actually helping older Canadians as optimally as they could?

As an example, let us consider dental implants and the rate at which they are being incorporated into the daily practice of Canadian dentists. It seems reasonable to assume that implant use would depend on the prevalence of missing teeth in a population and on the acceptance of implant treatment options by the dental profession and patients. In 2003, 9% of Canadians 15 years or older were edentulous and 30% of those 65 and older had this condition.[1] These figures highlight the importance of providing comfortable and long-term solutions to a large number of Canadians with permanent oral problems.

Dental implants have undergone tremendous improvements over the past decade to increase their success rate, minimize the level of complexity of use for dentists, and reduce procedure time and cost. Furthermore, because of its predictably successful long-term outcome, the use of oral implants to restore single and multiple teeth, or to support full dentures, has been widely promoted.

Globally, the field of implantology has been developing at a rapid pace. Nationally, sales in the Canadian dental implant market approached $70 million in 2006,[2] almost double the amount in 2002.[3] Paralleling this rise in implant sales is an increase in public awareness of and demand for implants. Naturally, one would expect more general dentists to consider the provision of implants as a treatment option.

Research, however, has shown that fewer Canadian dentists are actually placing and restoring dental implants than expected.[3] Could there be a lack of available information for Canadian dentists on dental implants? If that were the case, then it would minimize patients' chances of being offered the treatment option. This trend might even be more evident in dental clinics situated in rural areas.

It is important that dentists in Canada have access to a wide variety of sources of information to assist them in understanding and providing implant therapy. Since we were unable to find any published data on this issue, we decided to investigate the type and amount of material available to Canadian

dentists that could increase their knowledge and skills regarding implant interventions. We contacted 4 groups that serve as main sources of dental information to practising Canadian dentists: implant manufacturers, university dental faculties, dental associations and dental regulatory bodies. In particular, we wished to know whether dentists were offered articles about implant treatment, including scientific evidence to support this intervention; courses in which they could receive information on the rationale for this treatment, as well as clinical training to improve their skills in implant care; and any additional information or assistance to bring this new technology into their practices in the 2006 calendar year.

Based on our findings, we determined that there was an abundant amount of information on dental implants available to Canadian dentists in 2006, more than we had initially anticipated. The information was made available through continuing dental education or Internet-based courses, visits by sales representatives of dental companies, publications in Canadian journals and newsletters, presentations at dental conferences and meetings, brochures, emails, dentistry faculty websites, flyers and direct mailing and advertisements in dental journals and alumni magazines. The large amount of information disseminated suggests a high probability that all dentists have been exposed to implant-related information, regardless of geographic location.

Most of the information on implants was made available by implant manufacturers, who earmark considerable resources for marketing and education. However, many courses on dental implants were also made available by dental schools, dental associations and at least one dental regulatory agency. This shows that dentists have access to a wide range of reliable sources of information that should, at the very least, assure them that dental implant therapy or technology is scientifically supported.

The availability of continuing dental education courses on implants by dental schools, regulatory agencies and associations suggests that implant treatment has been accepted as a reliable, scientifically supported mode of therapy. Therefore, practising dentists who currently do not offer dental implants as a treatment modality to their edentulous patients are advised to investigate the field and inform their patients of these treatment options. Since dental implant therapy is a scientifically substantiated treatment, it is the responsibility of dentists to learn about this technology. It would be wise for dentists not currently offering this treatment modality to their edentulous patients to consider taking continuing education courses in order to educate themselves on the topic, since they are ethically and legally obligated to inform their patients about implants as an alternative to standard treatments. Not all dentists currently do so, which contravenes the principle of informed consent. Advances in technology within dentistry will continue, and new technologies that are improvements to current practice should be rapidly transferred to patients.

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

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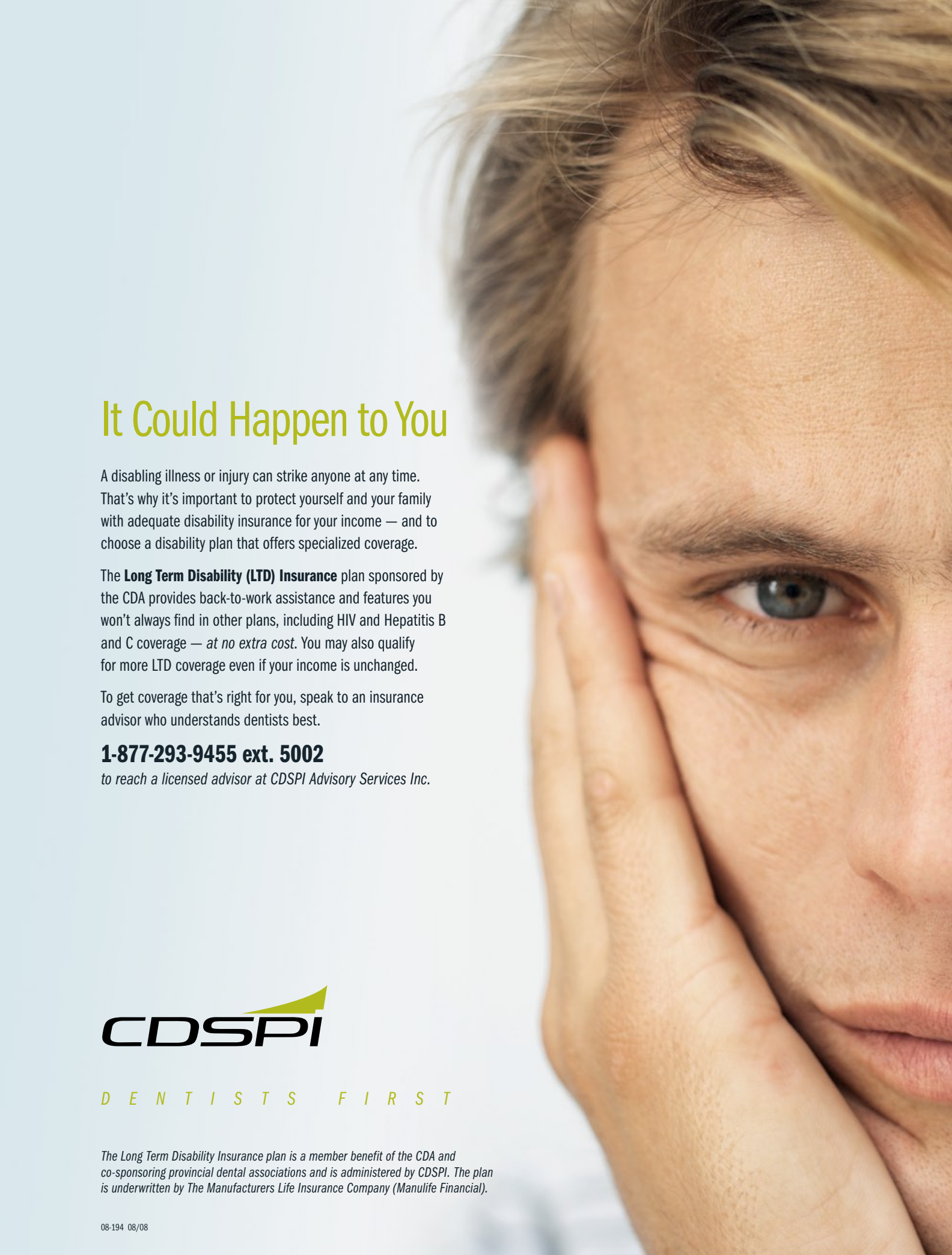

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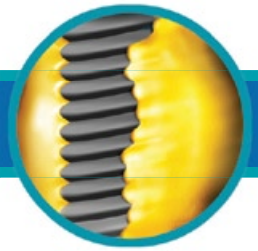

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New Technologies in Health Care. Part 1: A Moral and Ethical Predicament

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ABSTRACT

With the rapid evolution of technology and the development and marketing of new procedures in dentistry, dentists have difficulty keeping pace with all of this new technology and information. How do these clinicians know whether a new product, technique or technological advance is good and should be recommended? At what point do they have an obligation to inform their patients about new procedures supported by research? This first report of a 2-part series investigates the ethical aspects of these issues and describes some of the professional ethical dilemmas and obligations involved when new therapies are offered to the public.

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Since the 1960s, dentistry has made great strides in improving diagnoses and treatments for oral health disorders. Technological advances in equipment and materials, such as the air rotor and adhesive dentistry, have revolutionized the way dentists practise dentistry. But health professionals are having problems keeping pace with the exponential growth in medical knowledge of the last 20 years.[1] These medical advances have created many new challenges, as well as opportunities, for health care professionals.

Increasingly more complex ethical and moral issues arise out of the development and implementation of new technologies and new procedures.[2,3] In particular, when should clinicians, particularly dentists, inform patients about new therapies or procedures shown to be more effective than the current standard of care? Can dentists continue to provide the conventional treatments they learned in dental school without informing patients about new research-based treatment alternatives?

In this first article of a 2-part series, we discuss the type of information that dentists can confidently draw on to inform patients about new technology. We then explore the ethical and moral obligations when these health professionals are faced with the dilemma about whether to inform patients about a new technology.

This material was gathered from a literature review and interviews with experts in the fields of ethics, law and organized dentistry.

The Dilemma

With such a proliferation of new technology, how can a dentist remain current about the best and most important of these innovations? How can dentists be certain that a new product, technique or technological advance is good and should be recommended? On the other hand, what should these clinicians do when new evidence-based dental procedures offer better care, but many barriers to their integration into practice exist, such

as financial disincentives (lack of reimbursement), fear of liability, difficulty fitting the procedure into their usual office routine, perceived difficulty learning the procedure or the belief that patients might refuse the treatment because of a lack of insurance coverage or funds.[4–6] Are these adequate reasons to withhold information about new and better care? Dentists must first understand the factors that influence how they need to change or adapt their clinical practices before they try to incorporate research-based evidence into their clinical care. Without this understanding, they may not use these new evidence-based therapies.[7]

Which New Technologies Should Dentists Recommend?

Because clinical practice guidelines are not available for general dentists in Canada, they have to look for other resources to find evidence-based information about oral health issues. To know which new product, procedure or treatment they should recommend or offer to their patients, dentists have to be aware of the scientific evidence about the effectiveness of the technology so that their decisions are fully informed. This evidence can be found in the following sources:

- systematic reviews of the literature and meta-analyses that show the effectiveness of the new procedure (e.g., Cochrane Library, MEDLINE)
- articles in peer-reviewed journals (e.g., meta-analyses, randomized controlled clinical trials)
- consensus statements (e.g., NIH Consensus Development Program, http://consensus.nih.gov, 1-888-NIH-CONSENSUS)
- continuing education programs (e.g., university-based, accredited courses).

The website of the World Dental Federation (www.fdiworldental.org) is another good source of information about the effectiveness of new procedures or technologies that are appropriate for dental patients. The resources section of this website contains a database of scientific papers, publications (Cochrane reviews), meta-analyses, and review papers about oral health issues, including materials, techniques and procedures.

However, to cope with such large quantities of information, dentists need critical appraisal skills to evaluate the validity of these studies and their conclusions. In addition, they must be aware of the general standard of care, which is "what an average physician in good standing would do with the degree of skill and learning ordinarily possessed and exercised under the same or similar circumstances by other members of the profession."[1] In other words, dentists "must act consistently with the skill, knowledge and judgment that an average practising member of the profession would have," regardless of the amount of experience they have.[8] A newly graduated dentist is held to the same standard of care as the dentist who has been practising for over 20 years because the public expects a minimum standard of qualifications from all the members of the profession.[8] The standard of care today is defined by the best available evidence rather than by the pre–World War II guideline, or "locality rule," of judging the standard of care by what other practitioners in the same or similar communities would do in similar circumstances.[1,8–10] The Hall v. Hilbun decision of the Supreme Court of Mississippi replaced this locality rule with an American national standard of care, an important recognition of the influence of technology (the Internet) on the diffusion of medical knowledge.[1] According to the definition of standard of care, it is a dentist's professional duty to keep current on the latest medical developments, regardless of whether he or she is from a rural region or a capital city.[1,8]

Former Administrative Law Judge Jane B. Levin, Esq. (New York State Department of Health) believes that health professionals have a "duty to inform only if the new treatment has been clinically proven and if it is presented in a peer-reviewed journal. If a new treatment is being offered, it is even more important that conventional treatments also be offered. A treatment that is known to work cannot be withdrawn in favour of something that you think might work better." (2007, interview with Jane B. Levin) Dr. Peter Cooney, chief dental officer of Canada, believes that "you need solid evidence behind the technology and randomized clinical trials." (2007, interview with Dr. Cooney) Dr. Benoit Soucy, director of membership and professional services of the Canadian Dental Association, also explains that Canadian dentists have to be sure "if the new technology is commercially available, that it has been approved by Health Canada. Health Canada, in its regulation process, will require evidence of efficacy in terms of medical devices." (2007, interview with Dr. Soucy) According to the information on the website of Canada's Access to Medicines Regime, "manufacturers are required to submit scientific evidence of a product's safety, effectiveness and quality to Health Canada … before receiving permission to export it. Health Canada will review all products destined for export under the Regime to ensure that they meet the requirements of Canada's Food and Drugs Act and Regulations."[11] The Marketed Health Products Directorate "review[s] and analyse[s] marketed health product safety data and conduct[s] risk/benefit assessments of marketed health products."[12]

Do Dentists Have an Ethical Obligation to Recommend a New Technology?

Once clinicians feel confident about a new treatment option, do they have an ethical obligation to inform their patients about this new therapy or offer it to them? In a word, yes. Dentists must be truthful with their patients. Truthfulness is a very important part of ethical practice

Table 1 Ethical guidelines dentists should follow to be ethical caregivers

Category	Guidelines
Autonomy	The patient has the right to choose, on the basis of adequate information, from alternative treatment plans that meet professional standards of care. The dentist's preferred treatment plan may or may not be the patient's chosen treatment plan.[19]
Veracity	The dentist has a duty to communicate truthfully.[17] • **Cost** Dentistry often offers treatment choices with a range of costs. Each appropriate treatment alternative must be presented with its associated costs and benefits.[19] • **Choice of treatment** The dentist must discuss treatment recommendations, including benefits, prognosis and risks, reasonable alternatives and associated costs, to allow the patient to make an informed choice. The dentist must inform the patient whether the proposed oral health care involves treatment, techniques or products that are not generally recognized or accepted by the dental profession.[19] • **Provision of information** The dentist is obligated to provide patients with fair comment and opinion about their oral health.[19]
Justice	The dentist must remember his or her duty of service to patients and therefore is responsible to provide care for all members of society. A dentist shall not exclude, as patients, members of society on the basis of discrimination, which may be contrary to applicable human rights legislation.[19]
Beneficence	The dentist has a duty to promote the patient's welfare and to do no harm (principle of nonmaleficence).[17] • **Research and development** When the results and benefits of their investigations safeguard or promote the health of the public, dentists are obligated to make them available to everyone.[17]

because the relationship between health professionals and patients is built upon trust.[13,14] According to the Code of Medical Ethics of the American Medical Association about new medical procedures, physicians must share their skills and knowledge with patients and inform them of the results of clinical and laboratory research.[15] Jane B. Levin, Esq., explains that "ethically and morally, practitioners should inform their patients of their knowledge of alternative treatments. Ethically, [health professionals] should be obligated to advise patients that other treatments are available, even if they can't necessarily afford them." (2007 interview) Dentists are obligated to complete continuing education courses to learn about new, alternative treatments. This responsibility supports the patients' right to self-determination, which is based on being informed about a proposed procedure and about any and all reasonable alternatives to it.[16,17] Nondisclosure of medical information to patients without their knowledge or consent (therapeutic privilege)[16,18] is justified morally and ethically only when the situation is an emergency or when the information is counter-therapeutic and its disclosure could cause the patient greater physical or psychological harm than if the information were not disclosed,[16] a rare situation in dentistry.

Being aware of new advancements does not mean that dentists must actually implement all new procedures. They can choose not to and refer their patients to colleagues, but, at minimum, dentists must inform their patients about new procedures.[10] When a dentist decides to use a new technology, he or she must thoroughly understand the technology, and be prudent and competent in its use.[10]

Like any other emerging technology, new equipment and techniques in dentistry tend to cost more; some may argue that disclosing such luxury treatments to a patient can be unnecessarily cruel.[16] However, Dr. Cooney, chief dental officer of Canada, reminds us that clinicians should not take it upon themselves to deny such treatments to a patient and that it is very difficult to predict a patient's financial situation in 10 years. Dr. Cooney advises dentists to inform their patients about their options for treatment, including the more expensive alternatives, so that if, in the future, the patient is in a better financial situation, he or she will be aware of the possibilities (2007 interview). Of course, dentists must use their professional judgment about the patient's circumstances, but disclosure of information should always be favoured.[16]

To be ethical caregivers, dentists should be guided by ethical principles. These are listed in **Table 1**. If a patient

Box 1 Information that dentists should disclose to patients to obtain informed consent[16,21]

- ✓ Describe the prognosis, therapy and procedure.
- ✓ State the goals and means of the treatment.
- ✓ Disclose the success and failure rates of the treatments.
- ✓ Review the risks and benefits of the treatments.
- ✓ Suggest alternative therapies.
- ✓ Explain the consequences and risks of refusing the treatment.

chooses not to receive the proposed treatment, health professionals should explain the "likely consequences of not choosing the proposed diagnostic procedure or treatment..., [and] any significant long term physical, emotional, mental, social ... or other outcome which may be associated with a proposed intervention."[20]

To be informed, patients must be aware of any information that a prudent or reasonable person in the same circumstances would need to make a decision about a treatment.[16,21] To provide true informed consent, patients must formally communicate their decision about the procedure to their dentists.[21] If dentists want to know how detailed the informed consent should be, they should ask themselves "What information does this patient need to make a sensible decision, given the patient's situation (education and ability to understand medical concepts), goals, values, and needs?"[21] The information to be disclosed should include the prognosis, alternative goals and means of treatment, success and failure rates, benefits and material risks of the treatment, possible alternative treatments and consequences, and risks of refusing the treatment (**Box 1**).[16,21] When discussing the information needed to obtain informed consent, dentists must know the patient's level of understanding.[16,21] Better communication and higher levels of information-sharing may contribute to better patient satisfaction and reduce anxiety, and thus improve health outcomes.[18] However, informed consent is a dynamic process: even if a patient agrees to a series of given procedures, he or she can at any time withdraw his or her consent.[16]

Conclusions

Dentists have an ethical and professional obligation to inform their patients fully about all relevant therapeutic options and technologies that have been shown scientifically to be safe and effective. Providing fully informed consent is still a challenge to dentists because they must evaluate a very large number of new techniques, materials and procedures.[22] Therefore, as part of their ethical obligation to enable fully informed consent, dentists should give the same priority to the assessment of technology that they do to other aspects of their clinical practice. This will, in turn, maintain the public's trust in the profession[23] and will considerably reduce the potential for litigation.

Because of their cultural and social similarities, Canada and the United States follow similar ethical principles.[24] However, their legal systems are very different. In part 2 of this series, we discuss the legal and professional obligations of Canadian dentists involved in the transfer of knowledge about new technologies.

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New Technologies in Health Care. Part 2: A Legal and Professional Dilemma

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ABSTRACT

With the constant introduction and marketing of new dental technologies, dentists sometimes have difficulty deciding whether a new technology will be beneficial to their patients. At the same time, these clinicians are professionally and legally obligated to inform their patients about all appropriate therapeutic alternatives. In this second article of a 2-part series, we review these obligations, as well as provide information about where dentists can find the necessary scientific evidence on which to base an informed decision.

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We live in an era in which new technologies in the health care field are being researched, developed, tested and promoted at a dizzying pace. Today's dentists may feel overwhelmed as new technological advances in the field are constantly being introduced in journals, continuing education, and peer practice, and by health care supply companies and advertisements. How, then, do dentists know when it is time to take a particular dental technology seriously and begin offering it to their patients as a viable treatment alternative?

The first of this 2-part series of articles discussed the ethical and moral issues inherent in dentists' decision-making processes. In this second part of the series, we examine the dentist's legal and professional obligations about treatments involving new technology. We explore these issues through a review of existing literature and information gathered from interviews with experts in the field of ethics, law and organized dentistry.

Defining the Law

Although it is tempting to believe that legal matters are based on concrete laws and that a clinician's legal obligations are, therefore, simple to define, many factors complicate the situation. For example, laws vary, depending on geographic region within and between countries. American law, although similar in many respects, is not applicable in Canada. Most of Canada and the United States follow the common law system, which is based on custom and past court decisions. The province of Quebec and the state of Louisiana, however, follow the civil law system, which is based on codification and is not required to consider past decisions. To further complicate matters, clinicians can not only be pursued in civil court, but also be found liable under administrative or criminal law. As a consequence, clinicians need to learn how the law is applied in their own particular jurisdiction.

Duty of Care

Dentists, like all clinicians, owe a duty of care to their patients. The care dentists provide to their patients must meet the prevailing standard of care. Although the legal definition of standard of care varies in North America, in general terms, dentists are required to exercise the same degree of skill and care as could reasonably be expected of a normal, prudent practitioner of the same experience and standing.[1] If the standard of care for a particular case needs to be defined in court, the conditions and circumstances particular to the case are considered, and expert witnesses are often asked to testify to help the judge or jury determine a more situation-specific standard of care. In the words of Lorne Elkin Rozovsky, author of 17 books on health law, "The legally required standard is not static but varies. What is average, reasonable and prudent in one set of circumstances is or may not be average, reasonable and prudent in another set of circumstances."[2]

Dentists' judgments about whether their personal knowledge of new technologies and practices are in keeping with the current standard of care can be challenging. Their duty is to remain as current as possible to provide the best patient care, but this has become increasingly difficult in an information-intensive society.[3] To meet the standard of care, however, dentists are not expected to use a state-of-the-art device or technique unless it is already in common use.[2,4–6] If they choose to treat patients with experimental technology, dentists must meet a higher standard of care.[6] Regardless of whether the technology involves an experimental device or technique, or has been validated in evidence-based studies, these clinicians must be competent in its use.[7]

Informed Consent

Keeping up-to-date on new professional developments and advancements does not necessarily mean that dentists must personally implement all new devices or techniques. The importance of keeping current lies more with their responsibility to become aware of significant advancements in their profession so that they are able to inform their patients about these advancements. If dentists are unable or unwilling to personally offer a new treatment shown to be effective and appropriate for a particular condition, they must provide an appropriate referral to another practitioner.[7,8]

Although some American states hold the traditional view that health care practitioners should disclose the information that a reasonable practitioner would have revealed under similar circumstances (a physician-oriented standard), the more modern view in Canada, and in a good part of the United States, is that practitioners must disclose all material information, including any available alternatives to the treatment being proposed[6,8] that could potentially affect a patient's decision about a course of treatment (a patient-oriented standard).[8,9] Since the 1980 Supreme Court of Canada decision in the case of Reibl v. Hughes,[10] a modified objective patient test has been used to determine adequate disclosure: that is, would a reasonable person in the patient's particular position have given consent, if all material information had been disclosed?[6,8,11] The modified objective patient test essentially requires the practitioner to tell the patient what a reasonable person in the patient's position would want to know, given the circumstances.

To obtain informed consent, the practitioner must disclose such elements as the nature and purpose of the proposed treatment, the probable risks and benefits of the proposed treatment, reasonable alternative treatments, and the prognosis if the patient were untreated.[4,8,12–14]

Patients should therefore always be presented with a choice of treatment options as part of the informed consent, even if the only alternative is the refusal of treatment.[8,13,14] Reasonable alternatives may also include delaying a procedure,[10] disclosing a procedure that others may recommend, but the patient's practitioner does not,[13] and any other alternative that would allow the patient to make an informed choice about treatment.[13,15] Some courts may interpret the meaning of a practitioner's duty to disclose alternative treatment options as offering procedures that have some advantage over conventional treatments and are reasonably likely to achieve a beneficial result.[6] It is especially important for the practitioner to disclose the more conservative treatment alternatives that pose fewer risks.[6,9,11] That being said, practitioners should not offer a futile or inappropriate treatment that has no prospect of therapeutic benefit.[6,9]

Negligence

In 1995, the Supreme Court of Canada made it clear that "When a doctor acts in accordance with a recognized and respectable practice of the profession, he or she will not be found to be negligent."[16]

Tort law pertains to dentists' obligation not to cause injury to another, either intentionally or through negligence. The tort of negligence provides patients with protection against careless conduct that causes harm.[5] Negligence may be doing an act that should not have been done, doing an act in an improper way, or not doing an act that should have been done.[2] In civil litigation, 3 elements are required for a practitioner to be found negligent: 1) a duty of care must be owed, 2) a breach of the duty of care in which the standard of care was not met must have occurred, and 3) damage of a legally compensable kind, caused and foreseeably caused by the breach of duty, must have been suffered.[5,11,17]

Although these 3 elements were not explicitly outlined by the judge in the Quebec Superior Court case of Sunne v. Shaw,[15] this case clearly dealt with the health care practitioner's duty to inform patients about treat-

ment alternatives as part of the informed consent process. Details of this case are presented here to illustrate how the 3 elements essential for proving negligence are tied to a practitioner's duty to inform.

In Sunne v. Shaw, a dentist and plastic surgeon were both found at fault for failing to obtain informed consent from a 17-year-old girl with a congenital facial asymmetry. The first element required to prove negligence, that a duty of care was owed, is evident in the girl's consultation with the 2 practitioners in the hope that they would correct her problem, and in the establishment of doctor-patient relationships. The duty owed by both the dentist and the plastic surgeon included their duty to inform the patient of alternative treatment options as part of the informed consent process. The second element essential for negligence, breach of the duty of care, occurred when neither practitioner informed the patient about an alternative treatment (orthodontics) to the proposed maxillary surgery to correct her malocclusion. As an expert witness testified, orthodontic treatment was a more conservative and less dangerous treatment alternative than the maxillary surgery that the 2 defendants actually did. Under the circumstances, the standard of disclosure required that the defendants inform the patient of the existence of another possible treatment. The patient would then have been able to properly evaluate the risks of the proposed treatment against those of the alternative treatment. In much of North America, the patient-oriented standard is used to determine causation because of insufficient disclosure: would a reasonable person in the patient's position have agreed to the same treatment if all the appropriate alternatives had been disclosed? The patient in the case of Sunne v. Shaw underwent an osteotomy and suffered serious complications. The third element essential for negligence, injury and causation, would be satisfied if the judge were convinced that the patient would have chosen orthodontic treatment, had it been offered as an alternative.

Although the judgment in the case of Sunne v. Shaw did not use these 3 elements specifically to find the defendants guilty of negligence, these 2 practitioners were found to have failed in their duty to inform their patient about the existence of a more conservative alternative treatment.

Practical Evaluation of New Technology

Dentists are legally obligated to disclose available treatment alternatives to fulfill their duty of informed consent, but how do they know which treatment alternatives to offer, particularly if new technology may be involved?

Logically, possible treatment alternatives should, at a minimum, include those considered as a standard of care. Under the respectable minority doctrine, more than one acceptable standard of care may exist if the treatments are backed by reasonable practitioners who are well-respected in the field.[5,18,19] If a practitioner proposes an innovative treatment not yet considered a standard of care, it is even more essential that he or she also offer the conventional therapy.[5,6,11]

Dentists have a duty to keep their knowledge of new technologies up to date and to ensure that their practice meets the highest current standards. Interviews with several experts in the field of dentistry suggest that once a dentist becomes aware of a new technology, determining whether it is a feasible alternative that he or she must disclose to patients is very much dependent on the personal judgment of the individual practitioner.

Although dentists do not have to obsessively monitor new technologies in their field, they should make a reasonable effort to become aware of any significant advances.

Although dentists do not have to obsessively monitor new technologies in their field, they should make a reasonable effort to become aware of any significant advances. To do this, they can consult journals, speak with respected colleagues, and attend continuing education courses, conferences and the like. Dr. Euan Swan, manager of dental programs at the Canadian Dental Association, one of several representatives in organized dentistry, emphasizes the need for dentists to ensure that sufficient studies offering ample evidence exist in support of a new treatment before they suggest it to a patient as a reasonable alternative treatment.

The dentist is under no obligation to disclose treatments considered experimental or so innovative that insufficient evidence exists to validate the treatment. However, once the evidence begins to mount, determining whether a new technology is indeed effective and should be disclosed requires delving into the literature to evaluate the quality and quantity of the evidence. Because of the large amount of information available to the profession, dentists will not likely have the time to do extensive reviews personally. Although some may wait to be guided by leaders in the profession, Dr. Swan suggests that dentists consult peer-reviewed journals that publish reports of clinical research, as well as journals that summarize the evidence of recent research in systematic reviews. Using up-to-date knowledge and combining it with personal judgment to evaluate the patient's circumstances are dentists' main tools for deciding whether to offer a new technology.

Conclusion

Dentists cannot simply rely on what they learned in dental school or think, because a technique has been

successfully used for the past 30 years, that it still meets the standard of care. As a new technology becomes more widespread, its status approximates that of standard practice and increases the dentist's obligation to be aware of it.[5] Disclosure of reasonable alternative treatments is a legal obligation that requires the dentist to be more diligent about remaining up-to-date on new technologies. In an era when advancements in dentistry are more rapid than ever, dentists should be prepared to make this effort to meet emerging standards of care.

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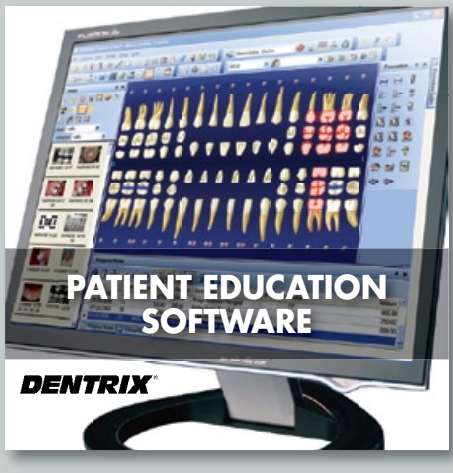

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Initial Investigation of the Relation between Extended Computer Use and Temporomandibular Joint Disorders

Romina Perri, *DMD;* ***Veronika Huta,*** *PhD;* ***Leonard Pinchuk,*** *PhD, DSc;* ***Cindy Pinchuk,*** *MSE;* ***David J. Ostry,*** *PhD;* ***James P. Lund,*** *BDS, PhD*

Abridged Version

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The literature shows that there has been a surge in the number of work-related musculoskeletal disorders of the upper extremity, which parallels the widespread growth in the use of computers over the past 2 decades.

Aim: To determine if temporomandibular joint disorders (TMDs) are associated with extended computer use.

Materials and Methods: Participants were recruited through the following advertisement, which was placed once in the *National Post*, a newspaper with Canada-wide distribution: "Do you suffer from headaches and/or muscle pain in your neck and shoulders? Do you spend many hours each day in front of a computer? Have you done so for several years? The Department of Psychology of McGill University, in conjunction with the Faculty of Dentistry, is currently studying the effects of long-term computer use on the head, jaw, neck, and shoulders." Interested readers were directed to a website to complete an online questionnaire, which included questions on computer use, medical history, pain symptoms, lifestyle and mood. Statistical methods used to study the relation between study variables included correlation analysis, multiple regression analysis, χ^2 contingency analysis and *t* tests for independent samples, as appropriate.

Results: Ninety-two respondents completed the online survey, but none of them responded to all questions in the survey. Of the 88 respondents who reported their sex, 49 (56%) were female. Most had used computers for more than 5 hours per day for more than 5 years, and most believed that their pain was linked to computer use. The great majority had pain in the neck (73/89 [82%]) or shoulder (67/89 [75%]), but many (40/91 [44%]) also had symptoms commonly associated with TMD (e.g., ear and face pain, joint noises, sore teeth and sinuses). About half of the participants reported poor sleep and fatigue, and many linked their pain with negative effects on lifestyle and poor quality of life. Two multiple regressions, with duration of pain as the dependent variable, were carried out, one using the entire sample of respondents who had answered the necessary sections of the survey (n = 91) and the other using the subset of people who had symptoms suggestive of TMD (n = 40). Duration of computer use was associated with duration of pain in both analyses, but 6 other independent variables (injury or arthritis, hours of daily computer use, stress, position of computer screen, sex and age) were without effect.

Discussion: The study yielded useful data, but the method of recruitment limited broad application of the findings. The advertisement appeared in only one newspaper and was probably read by only the wealthiest segment of the English-speaking Canadian population. The participants were self-selected, and computer literacy was a requirement for participation, given use of the online questionnaire. Furthermore, all of the participants had to be suffering from chronic pain, although potential participants were not informed that TMD symptoms were of particular interest. It is extremely unlikely that the study sample was representative of the general Canadian population; however, it may well be typical of the many computer users who suffer from chronic musculoskeletal pain.

Conclusions: This web-based survey provides the first evidence that chronic pain in jaw muscles and other symptoms associated with TMD are associated with long-term, heavy use of computers.

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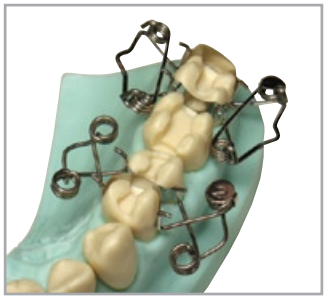

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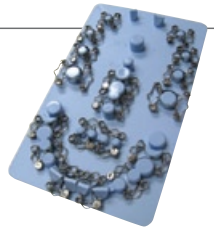

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Blended Learning in Orthodontic Diagnosis: An Interactive Approach

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ABSTRACT

Interactive multimedia programs can provide an opportunity for authentic learning both inside and outside the classroom. McGill University designed an interactive Orthodontic Diagnosis program on CD-ROM that has been used successfully in the faculty of dentistry to provide undergraduate students with interactive tutorials and exercises to help them recognize developing malocclusions. Key aspects of this multimedia program are the use of an outside-in approach to diagnosis as well as sound instructional design that provides practice opportunities and feedback to students. The goal is to bridge the gap between theoretical knowledge and the practical skills needed to be a successful dentist.

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The more active students are in the learning process, the greater their learning.[1–6] Active learning environments, such as laboratories, give students an opportunity to practise much of their theoretical knowledge and develop the practical skills they require to be successful in dentistry. In these environments learning must often be allowed to occur at an individual pace, as not all students progress at the same rate. This can be a challenge in face-to-face situations.[7,8] However, computer-assisted instruction can provide unique opportunities for self-directed learning by focusing on interaction, practice and feedback.

In the early 2000s, after a careful review of the orthodontic curriculum at McGill University, we decided to incorporate a multimedia, self-directed learning module, Orthodontic Diagnosis, into our curriculum. The main goal in using this approach was to enhance learning by letting students work at their own pace, reviewing the various concepts and practice exercises on their own outside the traditional laboratory environment. An additional issue we wished to address was frequent complaints from students who had difficulties finding information relevant to their training in conventional textbooks, as these were designed primarily for postgraduate students.

In an undergraduate dental curriculum, one of the most important goals of the orthodontic division is to train future dentists to recognize and appreciate the severity of malocclusions. No textbook presents a systematic approach to this aspect of undergraduate training. Delivering content by lecture alone is insufficient as this does not allow for the practice and feedback that is necessary to improve practical skills.[1,6]

Design and Development

Orthodontic Diagnosis software, comprising several units, was developed by McGill University and Dr. Jean-Marc Retrouvey. Created by a team of instructional designers, the learning modules incorporate important educational tools to allow students to understand the complexities and variability of an orthodontic diagnosis and provide them

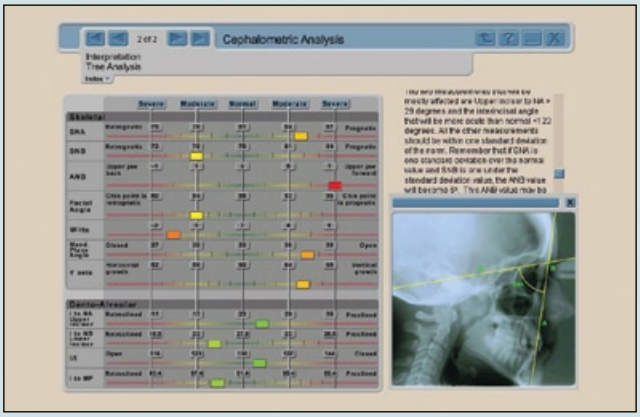

Figure 1: An interactive table illustrates the interrelations between various diagnostic measurements.

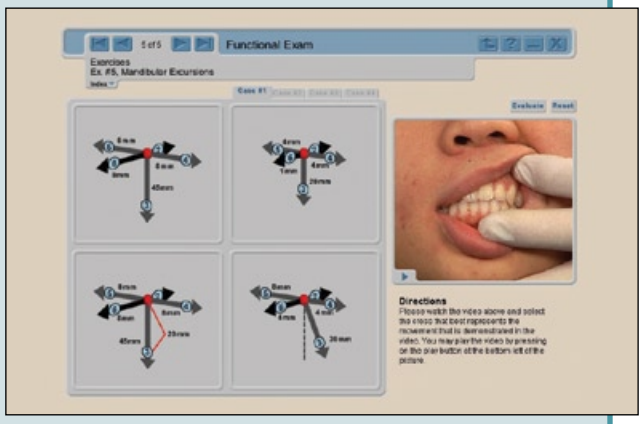

Figure 2: Video simulations illustrate examination techniques and elicit feedback from the student.

with an opportunity for authentic learning and feedback. In 2005, this interactive program won a Bronze Media Festival Award from the Health and Science Communications Association.

Dentistry students often have difficulty bridging the gap between theoretical knowledge and the practical skills they need for successful diagnosis of developing orthodontic problems. They often lack a whole-patient approach and over-focus on technical details. In our software program, multimedia content is combined with practice and feedback to give students individual opportunities to practise important concepts. Electronic tools were developed to simulate real instruments used in conventional diagnostic procedures, creating a virtual laboratory to assist in diagnosis.

On completion of the modules, students were expected to be able to recognize and identify a developing malocclusion, identify differences between normal and abnormal development, identify and apply the necessary diagnostic tools at the appropriate time and effectively diagnose a developing malocclusion.

Outside-in Approach

An "outside-in" approach to orthodontic diagnosis is taken, rather that relying on dental casts and radiographic observations alone. Before observing the dental occlusion, students are taught to examine the facial structures, the functional envelope of the orofacial complex and the complexities of the masticatory and orofacial musculature to obtain a complete picture of the patient's problem. Facial features as well as neuromuscular patterns must be examined thoroughly before a dental examination is performed. Similarly, panoramic and cephalometric analyses are important tools to obtain full information before arriving at a correct diagnosis.

Instructional Design

An effort was made to follow exposure to specific content with effective opportunities for practice, a key element in the success of the learning materials. Learning objectives were aligned with the presentation of interactive content and opportunities for practice and feedback were provided.[6,7,8]

The instructional design model followed in the project consisted of the following phases:

- Analysis: Determine what is to be learned, by whom and what skills need to be acquired.
- Design: Determine what types of learning experiences will be available for learners to achieve the goals of instruction.
- Development: Write and produce interactive materials, often with the assistance of professional programmers.
- Implementation: Select a few learners to test the program to determine what is effective and what needs to be improved.
- Evaluation: Gather data to support the efficacy of the project and determine how well learners are able to achieve instructional goals.[9]

Interactive Content

Interactive Tables

Interactive tables (**Fig. 1**) provide students with the opportunity to explore how various values shift based on changes in other areas.

Video Simulations

Video simulations (**Fig. 2**) were introduced to illustrate mandibular range of motion. Several articular disorders are simulated and the student is asked to find the mandibular displacement for each as well as the probable cause for the limited range of motion of the mandible in

Figure 3: Drag and drop features allow students to identify structures and features and receive an immediate evaluation of their accuracy.

Figure 4: Instruments, such as the Boley gauge, are simulated to permit students to make virtual measurements on a sample dental cast displayed on screen.

Figure 5: A simulated protractor is used for cephalometric analysis.

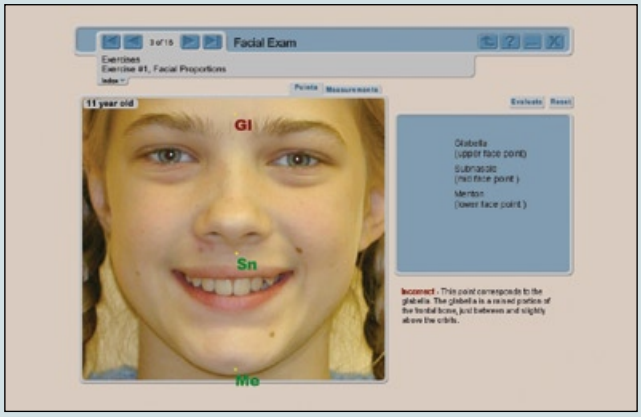

Figure 6: Green-, orange-, red-light exercises are used to quiz students in simple exercises, such as this one on observing facial proportions.

the test case. This process creates a controlled learning environment in which the student can understand a concept and practice it several times.

Practice

To allow students the opportunity for authentic learning, a number of computer tools were developed to simulate those they would use in practice.

Drag and Drop

A drag and drop tool (**Fig. 3**) allows students to practise recognition of structures and pathology. Students can identify anatomical structures in a safe, learner-controlled environment.

Boley Gauge

A virtual Boley gauge (**Fig. 4**) was developed to standardize exercises specifically for Bolton and Moyers' analyses. This tool and properly scaled dental casts allow students to practise from home and remove the need for an inventory of study casts. Three-dimensional models were a possibility, but were not used because of the high cost at the time of development and the fact that conventional plaster casts are still used in most dental practices.

A movable protractor (**Fig. 5**) allows students to learn and practise cephalometric analysis. Dental students as well as general practitioners do not routinely trace cephalometric radiographs. This exercise was mainly designed to introduce students to the diagnostic power of cephalometric analysis and allow them to practise on a computer model. In the future, we hope to incorporate tracing software, which is becoming more common.

Green-, Orange- and Red-Light Exercises

Students often voice the concern that they are not properly trained to recognize the complexity of a malocclusion. They do not appreciate the interactions between the various observed parameters that can guide them in the evaluation process. Breaking the information down into smaller pieces allows students to master more

easily attainable goals before proceeding. In the interactive program (**Fig. 6**), observations are organized into categories and assigned a colour: green signifies that the observed parameter is normal and will probably not contribute significantly to the malocclusion; orange means that the parameter is 1 standard deviation from the norm; and red signifies a potential problem that will require careful investigation by the learner.

Feedback

One of the most important aspects of the modules is the individual feedback that each student receives based on his or her work on the exercises. Feedback is provided after each question, directing the student if the answer is wrong or reinforcing the acquired knowledge. Breaking the exercises down into small sections and providing feedback after each section promotes mastery learning, a pedagogic method in which students master a step or concept before they are allowed to move to the next level.

An important aspect of this "formative feedback" during the learning process is that it allows students to practise and make corrections in a controlled environment before they are asked to perform the task in a test situation. The form of the feedback is not merely "correct" or "incorrect," but rather detailed responses on why a particular choice is correct or not and how students can improve their skills for the next exercise.

Key Advantages

This multimedia program has been well received by students as it allows them to learn at their own pace and apply the knowledge by carrying out simple but effective exercises. It is not designed as a textbook, but rather as a logical process within the framework of examination and accurate diagnosis of an orthodontic patient. Following an instructional design and development process is an effective method for producing an end product that is not only engaging to students, but also helps them learn the key elements of orthodontic diagnosis.

Other advantages include the transfer to a virtual environment of repetitive concepts, such as cephalometric analysis. Didactic classes on this topic have been completely eliminated and students are actually performing better using the technology than they did after traditional lectures and laboratories. Using the program, they can complete a cephalometric analysis without supervision or instructor assistance.

Evaluation of the Program

Another Canadian university has tested the Orthodontic Diagnosis software and preliminary reports are encouraging. Students like the concept and their rate of learning and retention of knowledge seem superior to those using conventional lecture-type delivery. These results are supported by the literature, which suggests that it is critical for students to be active learners and to be provided with practice opportunities and feedback during the learning process, rather than information only.[7,8]

Impact on McGill University's Dentistry Program

Initially, the modules were designed as a self-directed learning tool for full-time students enrolled in an undergraduate dental program. However, experience has shown that simply providing students with the modules was not enough; the students wanted more support from teaching staff. Now the modules are used in a more blended fashion, both inside and outside the classroom. "Blended learning is learning that is facilitated by the effective combination of different modes of delivery, models of teaching and styles of learning, and founded on transparent communication amongst all parties involved with a course."[10]

Lectures are supporting the content of the modules, and the modules are being used extensively for case presentation in third- and fourth-year classes. Each student has to present an orthodontic case to the rest of the class and the instructor provides feedback, not only on the observed case but also on the way data are gathered and used. This method standardizes case presentation seminars and eliminates confusion among students by providing a consistent way to deliver data pertinent to the patient's orthodontic diagnosis.

Students benefit from lectures based on the design and order used in the multimedia software; they carry out exercises in each section and are then asked to combine their new knowledge in a case presentation to their class. Every case presentation must follow the design and order (red, orange and green light concept) used on the CD. This approach standardizes the process, allows greater interactivity among groups and provides a better overall experience for the student presenting as well as the group receiving the information.

Future Plans for the Modules

With continuing improvement in bandwidth transmission rates, a web-based version of Orthodontic Diagnosis will be produced to allow even larger distribution. McGill University and Dr. Retrouvey are also working on an extension of the project by designing a virtual patient database using the same conceptual approach as used in the multimedia modules. This will contribute to the creation of a virtual environment in which a large number of relevant orthodontic cases can be presented. Learners will have the opportunity to study, practise and be evaluated on their knowledge of orthodontic diagnosis. This development, which is supported

by the Canadian Association of Orthodontists' foundation and McGill University, will enable orthodontic teachers to standardize their instructional material and ensure that all future Canadian dentists are trained in a similar fashion.

Conclusion

After 5 years of use, the Orthodontic Diagnosis program has been well received by students and seems to offer an interactive and successful method for learning the complexities of this discipline. Course evaluations consistently provide positive feedback regarding the user friendliness of the program

Sound instructional design provides a framework for future projects that will allow teachers to further improve instruction using a web-based environment. Students will have access to material that is always up to date and can be adapted to their own needs. Interactivity will engage students in their own learning experience by providing an authentic environment for practice and feedback to improve their clinical skills. Our next step with this program is to update it and make it available on the web to reach a larger audience.

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D E N T I S T S F I R S T

Effects of Psychological State on Pain Perception in the Dental Environment

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ABSTRACT

Psychological factors have an important influence on pain perception. Both in the clinic and in experimental settings, distraction has been shown to reduce pain. Further, negative emotions increase pain, whereas positive emotions have the opposite effect. Other more complex psychological states alter the way we feel pain. For instance, empathy for another person who is suffering increases our own pain experience, and expectation of pain relief underlies much of the placebo effect. Neuroimaging studies show a physiological basis for psychological pain modulation, with activity in pain pathways altered by attentional state, positive and negative emotions, empathy and the administration of a placebo. The same psychological factors activate intrinsic modulatory systems in the brain, including those stimulated when opiates are given for pain relief. It is important for the dentist and patients to understand the influence of psychological state on pain transmission. Such an understanding will not only help patients learn how to participate in their own pain control, but will also help the clinician create a fostering environment.

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Most clinicians probably notice a dramatic difference among patients in terms of the pain they report during and after dental procedures. For example, when patients undergoing third molar extraction are allowed to vary their degree of sedation according to the amount of stress caused by the procedure ("patient-controlled sedation"), some make very few or no sedation requests, whereas others request sedation more than 60 times during the surgery.[1] Are some patients more demonstrative than others, or does the pain experience actually differ from person to person? A number of factors can contribute to a person's pain experience, including genetic makeup, age, gender and life experiences, but one of the most important factors is the individual's psychological state at the time of the painful experience. In this article, we address how a patient's psychological state can affect his or her pain perception and the neurophysiologic basis of the psychological modulation of pain.

Despite a plethora of anecdotal accounts about people apparently experiencing little or no pain in situations that most of us would find intolerable, Western medicine generally fails to address a patient's ability to modify pain, focusing instead on pharmacologic treatments. Consistent with this attitude, most research on pain control has targeted peripheral and spinal cord mechanisms of opioid and anti-inflammatory analgesic therapy.

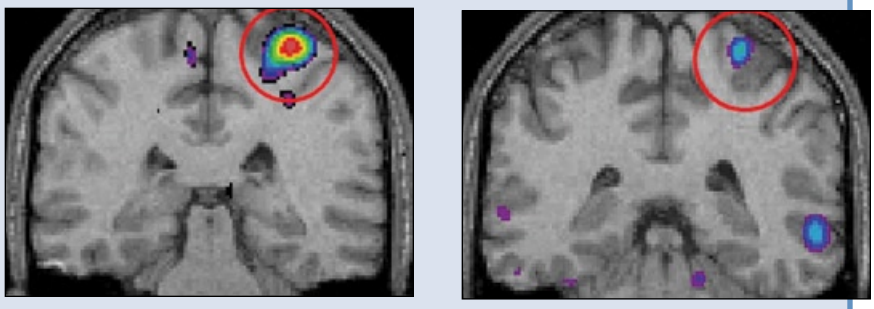

Figure 1: Activity in the primary somatosensory cortex when a painful heat stimulus and an auditory tone are presented simultaneously. Pain-related brain activations appear stronger when attention is directed to the painful heat stimulus (**left**) than to the auditory stimulus (**right**), suggesting that reductions in pain ratings during distraction from the noxious stimulus reflect real reductions in perceived pain. Brain activations were revealed by subtracting positron emission tomography data recorded when a warm stimulus (32–38°C) was presented from those recorded when a painfully hot stimulus (46.5–48.5°C) was presented during each attentional state. (Adapted with permission from Bushnell and others.[7])

Nevertheless, researchers increasingly recognize that a variety of pain modulatory mechanisms exists within the nervous system, and these can be accessed either pharmacologically or through contextual or psychological manipulation.[2] Variables such as attentional state, emotional context, empathy, hypnotic suggestions, attitudes and expectations, including the placebo response, have now been shown to alter both pain processing in the brain and pain perception. Techniques that modify these variables can preferentially alter sensory or affective aspects of pain perception or both; the associated modulation of pain-evoked neural activity occurs in limbic or sensory brain regions, or both, suggesting multiple endogenous pain-modulatory systems.

Attentional State Alters Pain

Attention is probably the most widely studied psychological variable that modifies the pain experience. A number of clinical and experimental studies show that pain is less intense when a person is distracted.[3,4] Overall, when people are distracted from the noxious stimulation, they report significantly lower ratings of pain. However, a few studies indicate that focusing attention on certain aspects of the pain may have the paradoxical effect of reducing its perceived intensity in certain individuals. For example, Hadjistavropoulos and others[5] observed that patients with chronic pain who were particularly health-anxious reported less anxiety and pain when they focused on the physical sensations. Thus, the effect of attention or distraction on pain may not be simple, but may be influenced by such variables as personality type.

In some studies,[6] patients have been asked to rate separately how intense the pain sensation is (pain intensity) and how much it bothers them (pain unpleasantness). These studies show that attending to another sensory modality during pain results in parallel reductions in both perceived intensity and unpleasantness of the pain, sometimes with greater modulation of pain intensity. Correspondingly, attention-related modulation of pain-evoked neural activity has been observed in pain pathways throughout the brain using neuroimaging techniques, such as functional magnetic resonance imaging and positron emission tomography. (Both techniques detect variations in neural activity indirectly, via the associated vascular responses, i.e., they measure the increase or decrease in regional cerebral blood flow, which occurs within a few seconds of the onset of a localized increase or decrease in neural activity.)

At the level of the cerebral cortex, imaging studies show that distraction from pain reduces pain-evoked neural responses in both sensory and limbic cortical areas, including primary and secondary somatosensory cortices (involved in encoding stimulus intensity and location), anterior cingulate cortex and insular cortex (more consistently involved in encoding stimulus aversiveness).[3] **Figure 1** shows greater activation of the primary somatosensory cortex by pain when the subjects are required to pay attention to the pain than when they focus their attention on an auditory stimulus. Thus, simply distracting a patient from his or her pain can have a profound effect on how the pain is processed in the brain and, consequently, on how it is perceived.

Our Emotions Affect Our Pain

Mood and emotional state also affect pain perception, with negative emotions leading to more pain than positive emotions. Clinical studies show that emotional states and attitudes of patients influence pain associated with chronic diseases.[8] For instance, depressed cardiac patients have greater perception of anginal pain (i.e., display an earlier onset and a more prolonged duration of angina) than nondepressed patients, which cannot be explained by differences in the severity of cardiac condition.[9] In patients with chronic pain, self reports of pain were significantly correlated with self reports of depressive symptoms and global affective distress.[10] This is also true for acute pain in the dental environment, where the level of preoperative anxiety has been shown to be posi-

tively correlated with postoperative pain immediately after preprosthetic oral surgery.[11]

In experimental studies, manipulations that have a positive effect on mood or emotional state, such as pleasant music, odours, pictures and humorous films, generally reduce pain perception, whereas those that have a negative effect on mood and induce negative emotions, such as anxiety, increase pain.[4] One problem encountered in the dental office is the often impregnating odour of eugenol, which is sufficient to produce autonomic responses consistent with fear, anger and disgust in patients who fear dental care and, thus, contributes to the strengthening of negative conditioning toward dental care.[12] The possibility of masking it with a pleasant and relaxing odour such as lavender or orange could be considered.[12,13]

By What Mechanisms Do Attention and Emotions Alter Pain?

The neural circuits involved in attentional and emotional modulation of pain are not fully known, but most likely involve various levels of the central nervous system. An opiate-sensitive descending pathway from the frontal cortex to the amygdala, periaqueductal gray matter (PAG), rostral ventral medulla and spinal cord dorsal horn has been implicated in psychological modulation of pain.[2] Some researchers have suggested that this pathway is involved in attentional modulation of pain, but these studies have usually used tasks that alter emotions as well as attention.

For example, Valet and colleagues[14] reported activation of the frontal cortex–PAG pathway when patients were distracted from their pain. However, they used the Stroop task as the distractor. In this task, subjects are presented with a list of colour names (e.g., green, blue), in which each word is displayed in a colour different from that expressed by the word's meaning (e.g., the word blue may be written in green ink). The subject's task is to name the colour in which each word is displayed, rather than the word itself. Although this task is distracting, it is also stressful and increases arousal. Thus, both emotional and attentional states were probably altered.

In our laboratory, we have used odours to manipulate attention to pain and emotional state independently and found that the PAG is preferentially implicated in emotional modulation of pain, whereas the superior posterior parietal cortex is more important in attentional modulation.[15]

How Can the Dentist Use Attention and Emotions to Reduce a Patient's Pain?

Both distraction and a positive emotional state alter pain, and they do so through separate modulatory systems. Thus, any activity that both diverts attention from a painful procedure and helps improve a patient's emotional state could be useful in a dental setting.

Dental procedures are often a source of anxiety in patients. The prevalence of dental anxiety in the general population ranges from 4% to 20%, independent of ethnic, social and cultural background, and its incidence is not reduced by improving dental treatment.[16] Because anxiety and stress increase pain perception, it seems important to use interventions that reduce anxiety and improve mood, in addition to distracting the patient. A number of methods can easily be implemented in the dental clinic setting, including playing music, showing humorous films on a monitor installed above the dental chair (or with a virtual reality eye-glasses system) or filling the room with pleasant odours. Such methods have been shown to be effective in reducing dental pain in some patients.[13,17,18]

However, it is important to keep in mind that not everybody responds equally well to the same behavioural strategy. For example, some authors found that both a brief relaxation method and music-induced distraction reduced dental anxiety significantly, but the relaxation method was particularly effective in highly anxious patients, whereas the music distraction did not have a clinically relevant effect on these patients.[19] Therefore, it would appear that gathering information on a patient's personality traits before surgery might help the clinician choose the most effective nonpharmacologic strategy for pain and anxiety control.

Providing accurate preparatory information before medical and dental procedures is a useful strategy to reduce the anxiety-related exacerbation of pain. In particular, providing preoperative information that includes a description of both the sensations that the patient will likely experience and the sequence of medical procedures has been found to yield the strongest and most consistent benefits in terms of reducing negative affect, pain reports and distress (compared with describing either sensory or procedural information alone).[20]

Finally, engaging patients in distracting activities during the postsurgical recovery period might also be beneficial. Levine and colleagues[21] observed that patients who underwent surgical removal of upper and lower third molars reported higher ratings of postsurgical pain if they were asked to express their ratings more frequently (every 20 minutes) than less frequently (every hour).

Social Influences on Pain

Although pain is commonly referred to as a private experience, research shows that social interaction influences how we perceive and communicate our pain. For example, the mere presence of another person in pain can modify our pain behaviour by promoting a form of imitative learning termed "social modeling." When patients are tested in a room with another person receiving

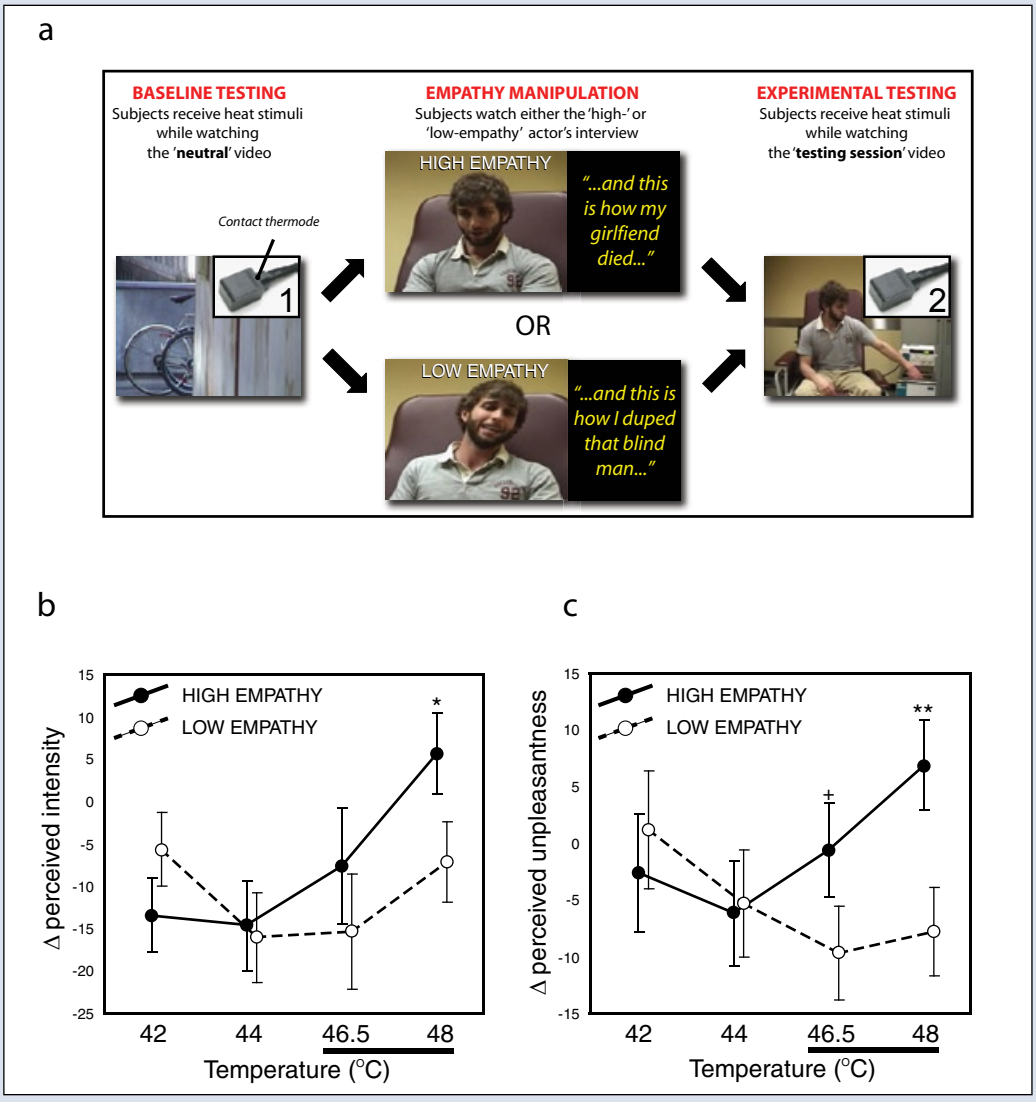

Figure 2a: Design of a study by Loggia and others[26]: Participants' sensitivity to nonpainful and painful heat stimuli was measured during their exposure to a neutral cityscape video. Half (high-empathy group) were then shown a video of an actor telling a sad personal story; the other half (low-empathy group) were shown a non-empathetic story. Thermal sensitivity was measured again while participants watched the video of the actor while receiving painful or innocuous heat stimuli.

Figure 2b and c: Effects of empathy on pain perception. Empathy increased perceived intensity (**b**) and unpleasantness (**c**) of painful but not of nonpainful stimuli. High-empathy participants reported the 48°C stimulus as more intense ($p < 0.05$) and unpleasant ($p < 0.01$) than low-empathy participants. Graphs show the average rating for each temperature while the participants watched the "testing video" minus the baseline rating recorded while the participants watched the neutral cityscape video. Bars represent mean ± standard error of the mean. + indicates $p = 0.06$, * indicates $p < 0.05$, ** indicates $p < 0.01$. (Adapted with permission from Loggia and others.[26])

painful stimulation, they will increase or decrease their pain behaviour to match that of the other person.[22]

People around us can also influence our pain behaviour by their attitude toward our pain. Illness or pain behaviour can be inadvertently reinforced if their occurrence is accompanied by some kind of "reward," such as special attention or the opportunity to avoid unpleasant situations. For instance, solicitous attention from parents predicts slower recovery from oral surgery in adolescent patients,[23] and the amount of parental attention predicts the intensity of recurrent abdominal pain in children.[24]

"I Feel Your Pain": An Empathetic Patient May Feel More Pain

There is now evidence that witnessing the distress of others can alter pain perception, independent of imitative behaviour. Langford and colleagues[25] showed that if a mouse is exposed to another mouse in pain, it displays increased pain sensitivity, but only if the 2 mice have had previous social contact with each other. The authors provided evidence that this social modulation of pain cannot be explained by imitation and proposed that empathy, or a precursory form of it, can induce an increase in pain perception.

A similar phenomenon has been shown in humans.[26] Participants were shown videos that induced a state of either high or low empathy. Subjects in the high-empathy group rated painful heat stimuli as more intense and unpleasant than those in the low-empathy group, but ratings of nonpainful heat did not differ between the groups (**Fig. 2**). As with the mice, the increased pain could not be explained by imitative behaviour.

Why does empathizing with others affect our own pain perception? A number of brain imaging studies have shown that watching another person in pain leads to the activation of brain areas involved in first-person perception of pain, such as the anterior cingulate cortex and rostral insula.[27] It appears that empathy sensitizes pain pathways of the brain. Thus, in the dental office, keeping waiting patients away from the sight and sounds of other dental patients might be an important measure to reduce pain.

Placebo and Orofacial Pain

Psychosocial factors, such as faith in the therapeutic procedure or desire for pain relief, contribute to the effectiveness of any medical treatment. In the clinical setting, it is difficult to dissect the relative contribution to the treatment response of pharmacologic versus psychosocial factors. However, the use of a sham treatment (placebo) can disentangle these effects. Brain imaging has been tremendously useful in establishing that placebo analgesia is indeed "real," by showing that placebo-induced pain relief is associated with a concomitant decrease in brain activity in pain-processing areas such as the thalamus and the insular cortex (**Fig. 3**).[28] This means that reported pain reductions following placebos are real effects rather than merely due to changes in pain reporting or compliance with experimental instructions.

How Do Placebos Exert Their Analgesic Effects?

Almost 30 years ago, Levine and colleagues[29] showed that pain relief induced by administration of a placebo after dental surgery could be blocked by the opioid-receptor antagonist naloxone. Since then, numerous reports have supported the idea that endogenous opioids are important in placebo analgesia. Endogenous opioids are essential for the descending inhibitory control of pain. The brainstem PAG and rostroventral medulla are 2 key areas for descending pain control[2] and, as we discussed above, this circuitry is probably involved in the emotional modulation of pain. These regions project to the spinal cord and trigeminal nuclei and inhibit incoming nociceptive signals. Human imaging studies show increased activation of brainstem structures during placebo analgesia, and the anterior cingulate and prefrontal cortices, which are activated by placebo procedures, may play a role in placebo analgesia by tapping into the descending pain inhibitory system via their projections to the PAG.[28]

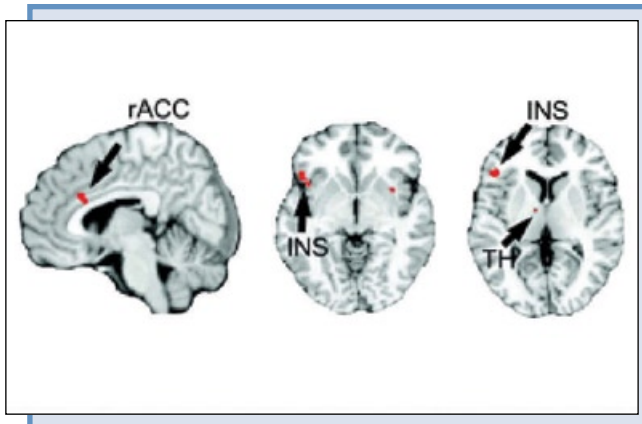

Figure 3: Pain regions displaying lower activity when patients report placebo-induced reductions in pain. When painful shock was presented to the participants, the rostral anterior cingulate cortex (rACC) was activated more during the control condition than during placebo (**left**). Similar effects were observed in insular cortex (INS) and thalamus (TH) (**middle** and **right**). These observations suggest that the reductions in pain reported by those receiving a placebo are associated with the dampening of neural pain-related activity and, therefore, cannot be explained in terms of response bias. (Adapted with permission from Wager and others.[28])

Conclusion

There is now extensive evidence that psychological factors influence pain perception. Neuroimaging studies show that activity in pain pathways is altered by attentional state, positive and negative emotions, stress, empathy and the administration of a placebo. The same psychological factors activate intrinsic modulatory systems in the brain, including those stimulated when opiates are given for pain relief. It is important for both the patient and the clinician to be aware of the effect of psychological state on pain transmission, so that the patient can learn to participate in his or her own pain control and the clinician can create an environment that helps the patient reduce anxiety, improve mood and focus attention away from the pain.

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