JCDA
Journal of the Canadian Dental Association

Vol. 71, No. 2 February 2005

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Journal of the Canadian Dental Association

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*CRA Volume 27, Issue 1, January 2003.

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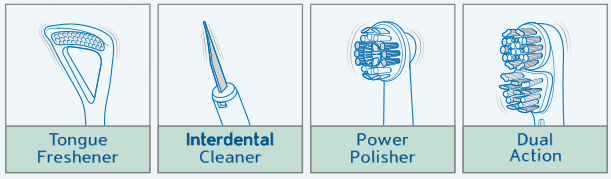

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1 Heanue M et al. Manual versus powered toothbrushing for oral health (Cochrane Review). In: The Cochrane Library, Issue 1, 2003, Oxford: Update Software **2** Sicilia A et al. A systematic review of powered vs manual toothbrushes in periodontal cause-related therapy. J Clin Periodontol 2002; 29(Suppl 3):39-54. **3** van der Weijden, GA et. al. Powered toothbrushing compared to a professional polish. J Dent Res 2001; 80 (Spec Iss): 743 Abstr.1734.

Guest Editorial

LET'S MAINTAIN OUR NATIONAL STANDARDS

Dr. Donald M. Bonang

Extensive amounts of time, human resources and finances are being directed toward responding to the growing perception that Canada is experiencing a shortage of dentists. Members of the public and government express concern that access to timely and affordable dental care is becoming harder to attain. Many avenues are being explored in an effort to address this concern, be it real or perceived.

One direction that causes great concern to this writer is the request that Dental Regulatory Authorities (DRAs) "massage" long-established registration requirements in order to allow dentists trained outside of North America to practise in this country.

The quality of dental health care available to Canadians is among the best in the world. This did not happen by chance or by accident. Rather, it has evolved over many decades. The increase in knowledge, education, skill and competence of the profession has resulted in a high standard of care, creating one or more generations of Canadians who may never experience the ravages of dental decay and tooth loss.

The dental profession is extremely proud of this accomplishment, which is largely due to preventive measures developed and implemented by the profession itself. Accreditation of our training institutions and programs, successful completion of national examinations and mandatory continuing dental education requirements for re-registration all set and maintain standards that the public expects and respects. The Canadian public benefits from these high standards which are set at a national level.

If we are experiencing an actual shortage of dentists in Canada and not simply caught up in the general perceptions related to the delivery of overall public health care, then how should we address this shortage?

There can be little doubt that a country as prosperous as Canada has the ability to educate sufficient human resources to continue to provide a high standard of dental care for its citizens.

Should the government not assist its citizens to gain a seat in our highly competitive and limited learning institutions by expanding these institutions? Should the government not compliment the dental profession on the maintenance of our standards? Unfortunately, this is not the government's current focus in addressing the manpower issue. Certain DRAs are being directed to make access to registration an easier, friendlier process for applicants educated outside of our accredited institutions.

National meetings have been frequent as DRAs work tirelessly to develop and respond to working documents, while discussing alternatives with the dental schools. Since registration is a provincial jurisdiction, DRAs are inclined to address local or provincial issues that can have a negative rippling effect on other jurisdictions.

Critics of the licensing authorities and DRAs suggest that certain barriers have been created to "protect their own" or to "close the doors to outsiders." Such allegations are offensive to a profession that has established high standards to protect the public interest. Governments should not be permitted to force any lowering of standards or the creation of multiple avenues to registration in this country.

I recognize the complexity of this issue, with its social, humanitarian and political implications. Should there be access to the dental profession for foreign-trained dentists? Of course. Should there be varying levels of competence in the dental profession? Of course not. Should there be assistance available to foreign-trained dentists to upgrade to our standards? Yes, but at whose expense?

My concern is that the government will continue to react from a political standpoint — one that may conflict with the best interest of the Canadian public. DRAs must not respond in isolation and focus solely on local issues and pressures. Our approach must be to address the issues from a national perspective, balancing humanitarian concerns with the maintenance of the high standard of dental health care that has been achieved in Canada.

Dr. Donald M. Bonang
Former registrar of the Provincial Dental Board of Nova Scotia.

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

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President's Column

HEADING IN THE RIGHT DIRECTION

Dr. Alfred Dean

When I was a teenager, my father and I would often go fishing for the weekend. The journey to our favourite lake entailed a 3-hour trek through the bush following a blazed trail. On one of these expeditions, the rain had been incessant and we decided to head home quite late in the day. It soon became clear that we had lost the trail. Being only 15 years old and not possessing my father's keen sense of direction, I was worried that we would become permanent woodsmen. With darkness setting in and with my father's reassurance that he had a plan, we spent the night circling a fire trying to stay warm and dry.

Why do I recount this tale? In 2005, representatives of Canadian dentistry in its many forms will convene in Ottawa to create a strategic plan for the profession nationally. The Canadian Dental Association's (CDA) current strategic plan has been in place for 5 years and now needs to be reviewed. Many goals from our previous strategic plan have been accomplished. Others are in progress and will continue to occupy our future efforts. And frankly, there are some areas where results have not met expectations.

Reading from our current strategic plan, I note many significant achievements. In government relations, our ongoing lobbying efforts are opening many doors on Parliament Hill. A recent edition of *Communiqué* showed a productive Days on the Hill session, displaying photographs of some of the candid conversations that took place during our meetings in November. In other areas, we have resolved our governance issues and have initiated the process to adapt our membership model to meet members' needs.

CDA has created a strong working alliance with educators and regulators as part of our commitment to address complex education and registration issues. In our efforts to embrace change, we are preparing conferences on 2 timely topics, seniors' care and models of caredelivery.

Internationally, Canadian dentists are routinely consulted on issues of importance to the global profession. This past year, CDA announced a thorough review of all of our policies and position statements. This includes reviewing our infection control guidelines to ensure that they meet current international standards and adhere to up-to-date scientific literature.

All organizations, whether large or small, should realize that an overarching strategic plan is a key determinant of success. The plan should be designed so that an organization can effectively use its resources while keeping focused on important macrolevel issues.

As a Nova Scotian, I envision CDA's strategic plan as the iconic schooner *Bluenose II*. It would not be wise to turn such a vessel on a dime, to head into uncharted waters. Rather, it must stay on course while remaining sensitive to the changing conditions that occur along the voyage. Plotting a definable navigational route, while remaining willing to gradually alter the course when necessary, is crucial to arriving safely at your destination.

Which brings me back to the story of the lost fishermen. When morning broke bright and dry, my father put his plan into action. Within 20 minutes we were back on the right path, and the trout tasted that much better upon our return home. I am sure that my father saw the time spent by the fire as a chance for father–son bonding, allowing us to regroup and discuss his plan. Similarly, I look forward to gathering with colleagues from across Canada at the strategic planning session, to discuss ways to keep the Association moving along a positive path.

Like other organizations, CDA can only be successful with the help of our members. We need your help — please help us.

Alfred Dean, DDS
president@cda-adc.ca

In response to the tragic events in South Asia and East Africa, I wrote to the National Dental Associations of the countries directly affected by the tsunami, expressing the sympathies of Canadian dentists. Through our involvement with the FDI World Dental Federation, CDA offered these Associations our assistance in whatever form is deemed necessary. On a personal note, I would encourage members to make a donation to a charitable organization of their choice.

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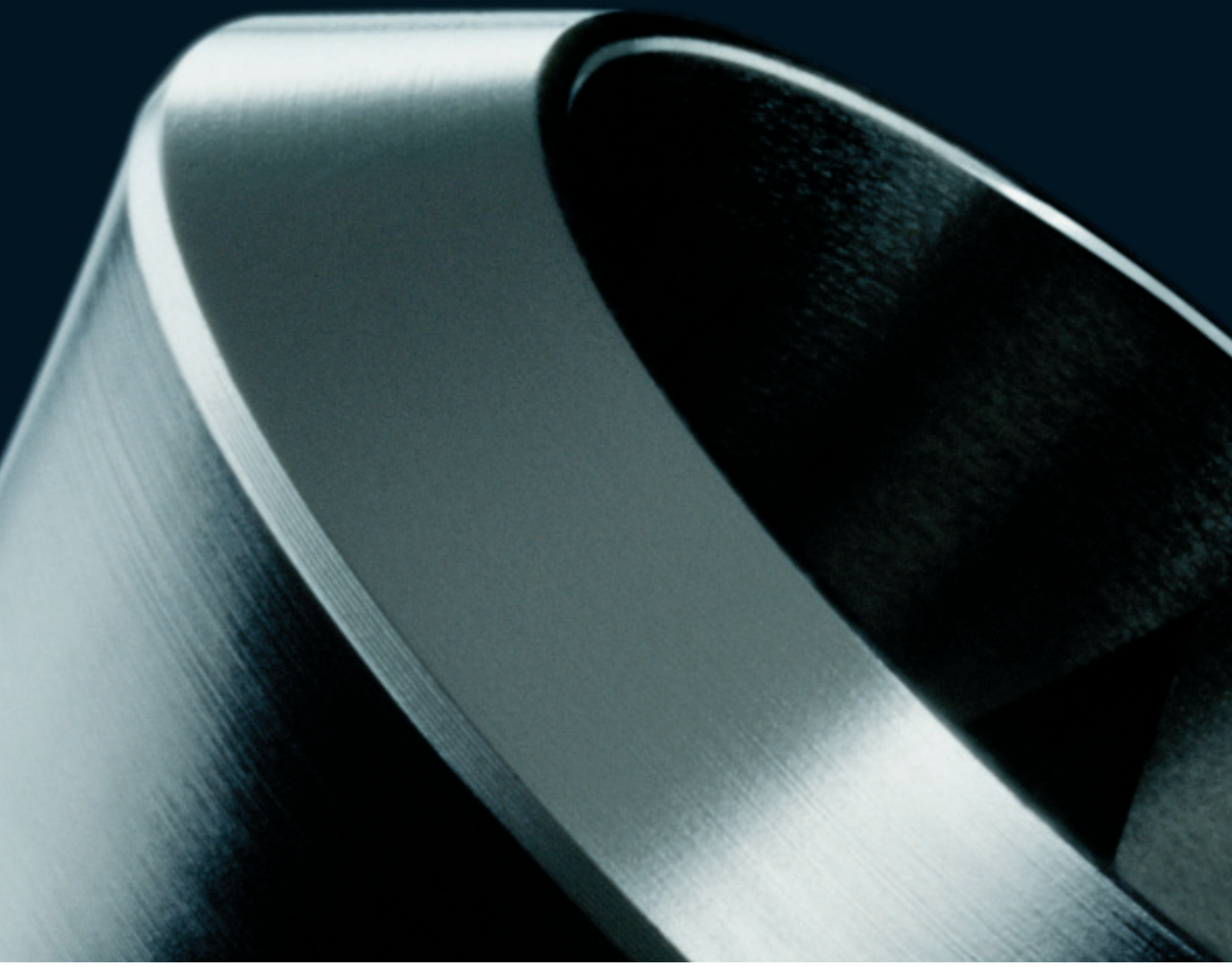

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Letters

Editor's Comment

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

National Medicare System

I write in response to Dr. Alf Dean's invitation[1] to comment on whether dentistry should be included in the provincial programs that make up our national medicare system.

First, I point to the fact that we already have, through income tax policy, a government program to subsidize dental care. To quote the Toronto Dental Coalition (TDC) brief to the Romanow Commission: "(the premiums paid by) employer health plans are tax-free benefits. These constitute lost revenue to the federal government. In essence, this means that low income Canadians must either pay out of pocket or do without dental care while subsidizing high-income Canadians to receive care that they are denied." As the TDC brief further points out: "A basic inequity exists when economically disadvantaged Canadians subsidize higher-income Canadians to receive dental care ... If there are to be subsidies for dental health they should be provided to those who need them."

So the question is not whether to have dental care included in publicly funded health care, but how to redirect the present system of subsidies — if not to all, then at least to those most in need. In the absence of an alternate model, more and more groups, including seniors and elected officials in local municipalities, are calling for the inclusion of dental care in medicare.

In my opinion, it is long past the time for CDA to develop a position that truly addresses the inequities in the financing and access to oral health care for all Canadians.

Dr. James L. Leake
Toronto, Ontario

Reference

1. Dean A. The ability and the will. *J Can Dent Assoc* 2004; 70(9):589.

I am writing in response to Dr. Alfred Dean's column[1] in which he asks whether dentistry should be included in the national medicare system.

The answer is far from simple. The principles of the Canada Health Act, namely universality, comprehensiveness, portability, accessibility and public administration, are admirable criteria, but will result in dentist shortages and may have an impact on the unique dentist–patient relationship we are so proud of. I respect CDA's position on strengthening the social safety net and providing adequate funding to our dental faculties. For the Minister of State for Public Health to say that Canada has a "health care system where the mouth is not considered a part of the body" is not quite accurate, as historically, hospital-based dentistry was covered by medicare. Perhaps the best approach for the profession is to maintain its independence and simultaneously lead the way in health care.

Dr. Elvine Y.W. Jin
North York, Ontario

Reference

1. Dean A. The ability and the will. *J Can Dent Assoc* 2004; 70(9):589.

Shortage of Dentists

I would like to comment on your October editorial on the migration of professionals,[1] which I found especially interesting.

Dentists are indeed on the move and we have noticed this global trend even in Norway. In our country, the maldistribution of dentists is felt especially in the north and we have struggled with this problem for many years. Recently, dentists have come from South America, Eastern Europe, the Far and the Middle East, Africa, and the former Yugoslavia and Soviet Union. None of these dentists come from schools with accreditation status in Norway. Most of them are attracted to the higher earnings, but others come for completely different reasons.

To have a Norwegian licence to practice, these dentists must first pass a language test then take a one-year course in one of our dental schools. If they do not pass the exams after the first year, they have to attend for 6 more months or until they are able to pass all the exams. Up until now, we have had under 20 candidates starting each year. This course is free of charge and the candidates normally apply for student loans.

I have been lucky to participate in the licensing process in my area of specialty — radiology. The dentists are all motivated and eager but their experience varies widely, depending on the institution they graduated from. Some of them have never exposed or evaluated a radiograph, but others could probably go directly into a dental practice. Why are we then using resources to teach them further? I believe we should consider accreditation status for certain foreign schools in my country too.

Under the current conditions, foreign dentists get free education and student loans, which makes Norway a popular destination (although the language is difficult to learn). Even so, I wonder if they will help solve the

shortage of dentists in the northern part of our country.

Dr. Liv Skartveit
Bergen, Norway

Reference

1. O'Keefe J. A profession on the move. *J Can Dent Assoc* 2004; 70(9):587.

Ethics and Cosmetic Dentistry

Hardly a day passes that I don't receive some literature or a brochure outlining a cosmetic makeover. Almost invariably, the procedure involves placing 8 or 10 veneers on healthy teeth. The author will state that alternative treatment strategies were presented, but that the patient opted for the immediate (although more invasive) procedure.

Most aspects of cosmetic dentistry are active treatment modalities and carry the risk of iatrogenic damage. I personally have seen teeth lost as a direct result of misadventure secondary to veneer placement on healthy teeth.

I know of no dentist who would do a root canal on a vital, healthy tooth. Placement of a veneer on a healthy, vital tooth is equally unconscionable. The justification that the patient wanted veneers is, in my opinion, just a platitude.

Dr. Welie really got it right in his article on professionalism[1] when he states that cosmetic dentists are not incompetent, dishonest or otherwise immoral, but rather that the ethical structure of their practices differs from that of professional dentists.

Dr. John G. Evans
Edmonton, Alberta

Reference

1. Welie JV. Is dentistry a profession? Part 3. Future challenges. *J Can Dent Assoc* 2004; 70(10):675–8.

Is Dentistry a Profession?

I commend Dr. Welie on the first 2 articles of his series on professionalism.[1,2] I do take exception with the assertion, in the third article, that "dentistry does not qualify as a profession when and to the extent that interventions performed are purely elective instead of medically indicated" and that the ethics of cosmetic dentists are "akin to an interior designer rather than an oncologist."[3] My definition of a dental professional is one who serves his or her patients well and who provides the necessary services that the patient deems appropriate and which are also in the patient's best interests. Is an aspiring model's need for straight, white, esthetically pleasing teeth (which are necessary to secure gainful employment in his or her chosen career path) any less important than removing an impacted third molar? Should we judge the merits of our patients' needs against our own lofty professional definitions? I have met many physicians who look down on dentists because our professional services do not equal their life-saving interventions. Yet when they have a toothache or become so terribly self-conscious about their discoloured central incisor that they no longer smile, the merits of dentistry become painfully obvious.

Dr. Welie goes on to contrast patient acceptance of recommended treatments on the basis of objectively determined beneficial treatment. In a guild model (paternalistic) or agent model (patient dictates treatment), I could agree. However, in an interactive professional relationship, which is the normative model, the dentist learns about the patient's values and the patient is given information to understand the dentist's professional values. Treatment is only initiated when there is consensus on shared values, which results in mutual respect being reinforced. The point is that values are not standardizable.

Finally, on the issue of dentists who "charge so much," dentistry can exist as both a proud profession and a source of economic sustenance. There is a limit to altruism. If all dentists were to drop their fees to the point where every member of society could agree that they could now *afford* the treatments, there would only be bankrupt dentists and consequently, no access for anyone. How could that serve the public interest? Yes dentistry is costly, just as good medical treatment in hospitals is costly. Dentists need to assist in finding creative solutions to a societal problem; our professionalism demands it. I, for one, am convinced that we are up to the challenge.

Dr. Barry Schwartz
Adjunct professor of practice administration
University of Western Ontario
London, Ontario

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1. Welie JV. Is dentistry a profession? Part 1. Professionalism defined. *J Can Dent Assoc* 2004; 70(8):529–32.
2. Welie JV. Is dentistry a profession? Part 2. The hallmarks of professionalism. *J Can Dent Assoc* 2004; 70(9):599–602.
3. Welie JV. Is dentistry a profession? Part 3. Future challenges. *J Can Dent Assoc* 2004; 70(10):675–8.

Response from the Author

Dr. Schwartz appears to prefer a different definition of professionalism than the one I provided. Evidently, a different definition is likely to yield different conclusions. Based on his definition, Dr. Schwartz concludes that cosmetic interventions are consistent with a professional dental ethic. However, it seems to me that his own definition actually underscores my conclusions.

Dr. Schwartz correctly deems patient needs (as opposed to wishes or wants) to be objective. That is to say, they can be examined and assessed by third persons. I can, of course, refuse to consent to proposed treatments (because I do not deem them, in Schwartz's words, "appropriate," or because the price is too high, or for no reason at all). In that case, my dentist will respect my refusal; legally, he or she has no other option. But the dentist is unlikely to agree that I apparently do not *need* these treatments, because

Continued on page 133

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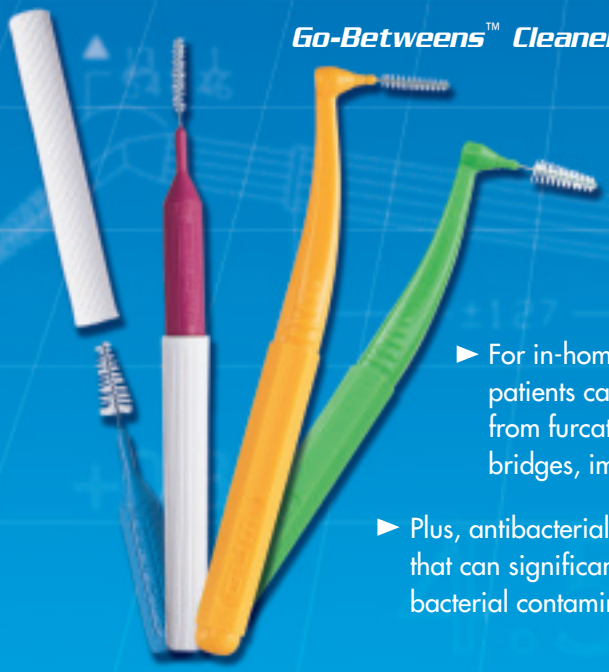

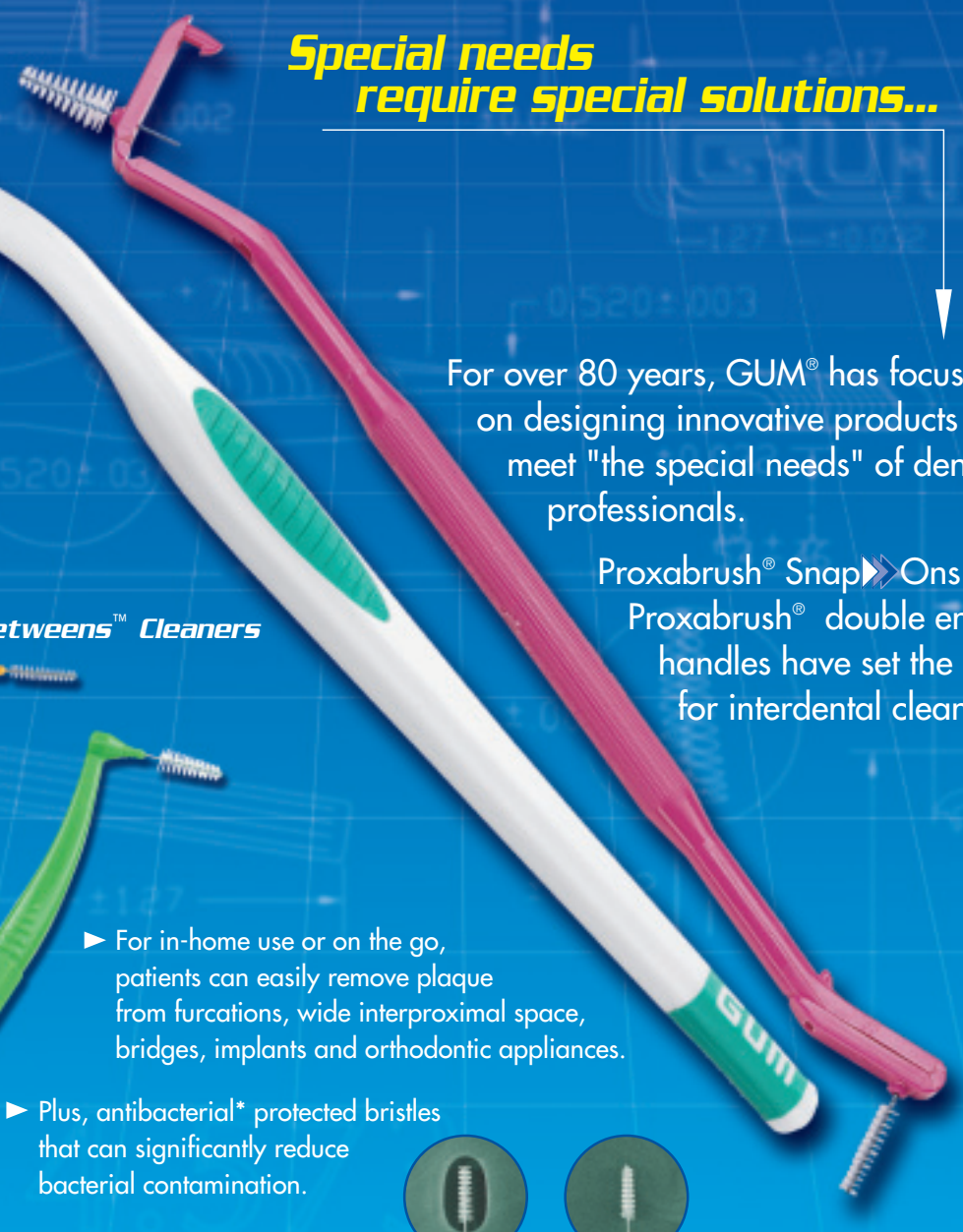

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News

Canadian Dentistry and Tsunami Relief

CDA is supporting the long-term rehabilitation and reconstruction efforts that will be required in the countries affected by the earthquake and tsunami which occurred in December.

In the aftermath of the event, CDA wrote to the national dental associations of these countries, expressing its sympathies. The letters also indicated that CDA will assist the FDI World Dental Federation, as this organization will coordinate international rehabilitation efforts.

Domestically, CDA officially offered its assistance to the RCMP and the Ministry of Foreign Affairs, as the RCMP's Tsunami Missing Persons task force may require antemortem dental records for identification purposes. CDA consulted with the RCMP and leading Canadian forensic dentistry experts on current dental record protocols. A summary of their advice can be found on the members-only side of the CDA Web site at www.cda-adc.ca (CDAlert dated January 10, 2005).

FDI News

FDI Responds to Tsunami Disaster

The FDI World Dental Federation has offered aid to the Southeast Asian countries affected by the tsunami. The aid will be channelled through the World Dental Development Fund (WDDF); any program applications related to the disaster will receive priority.

Relief efforts are initially focusing on communicable diseases, environmental health and sanitation, and psychological trauma. Oral health will be part of the long-term reconstruction phase. FDI experts will help member associations and related organizations with technical advice, particularly on infection control, needs assessments and grant development.

The FDI Education Committee is developing special programs for the next Congress to address the role of dentists and dental forensics in mass disasters.

FDI encourages donations to the WDDF. "By donating to the World Dental Development Fund, we can show solidarity with and compassion for the victims of this unparalleled disaster," said FDI president Dr. H.R. Yoon. To find out how to donate to the WDDF, visit the FDI Web site at www.fdiworldental.org (press release dated January 12, 2005).

China to Host FDI 2006 Congress

FDI announced that its 2006 Annual World Dental Congress will be held September 22–25 in Shenzhen, China. This will be the first FDI Congress to be held in the East Asian superpower. Dr. J.T. Barnard, FDI executive director, is anticipating that the meeting in China will be extremely popular: "We believe there will be great enthusiasm from our international colleagues to visit this culturally rich and fast-developing country."

DCF's Inaugural Dental Celebration Raffle a Success

The Dentistry Canada Fund (DCF) held its inaugural Dental Celebration Raffle on November 27, 2004, during the DCF Board of Directors meeting in Ottawa.

The raffle was organized to raise funds in support of DCF's education, research, and promotion and public outreach programs. DCF attributes the success of the raffle, which generated approximately $30,000 of net revenues for the charity, to the generosity of its participating sponsors and the individuals who purchased tickets.

DCF awarded 10 prizes in this inaugural raffle. The grand prize of a Dentech Advance Operatory was won by Dr. Deborah Stymiest of

COVER ARTIST

Dr. Shaukat Chaney is a retired dentist who now sculpts and paints full time at his WaterWalks studio (www.waterwalks.com) in Cumberland, Ontario. Dr. Chaney was introduced to oil painting in 1974 while enrolled at the University of Minnesota's Graduate School of Dentistry. Painting was included in the program to create a better understanding of colours used in dentistry. His interest in sculpture began a year later, while he was working on maxillofacial prostheses for trauma and cancer patients at the College of Dentistry, University of Saskatchewan. Dr. Chaney believes that his training in visualizing and understanding colour made him a better artist.

The artwork on the cover is a bronze sculpture of Dr. Wilfred Cotter. The sculpture was commissioned by Dr. Cotter's family after he passed away last year. Dr. Cotter was a professor of prosthodontic dentistry at the University of Saskatchewan until his retirement in 1988. "I had the privilege of teaching with Dr. Cotter for 11 years," explains Dr. Chaney. "I submitted this sculpture for the cover of *JCDA* as a tribute to a great dentist."

Fredericton, New Brunswick. For the complete list of winners and sponsors, visit the Media Room section on CDA's Web site at www.cda-adc.ca.

Henry Schein Acquires Ash Temple

Henry Schein Inc., the largest provider of health care products and services to office-based practitioners in the combined North American and European markets, announced the acquisition of Canadian dental distributor Ash Temple in January. The operations of both companies will be combined under the new name Henry Schein Ash Arcona. The chair of the new entity will be Michel Hart, the former chair and CEO of Ash Temple. Henry Schein Arcona's 100-person dental sales force is expected to double as it begins offering a full-range of dental products and services to dental practitioners across Canada.

Conferences and Gatherings

Women's Leadership Conference

The American Dental Education Association (ADEA) is sponsoring the Third International Women's Leadership Conference, which will be held in Montreal from August 28–30, 2005, in tandem with the FDI Annual World Dental Congress. The goal of the conference is to foster global alliances and deliver leadership strategies that women can use to improve oral health and overall health in communities throughout the world.

For information about the conference or submitting abstracts (submission deadline is March 4), visit the ADEA Web site at www.adea.org.

PFA Gala

The Pierre Fauchard Academy (PFA) will be holding a special Awards Dinner Gala on the evening of August 24, 2005, following the opening ceremonies of the FDI Annual World Dental Congress in Montreal. The gala will be held in the Atrium of the Montreal World Trade Centre. This year, PFA will be presenting the Elmer S. Best Award to Dr. George Zarb, in recognition of his contribution to the dental profession.

A block of rooms at the Intercontinental Hotel has been reserved for PFA Fellows who wish to attend the FDI meeting or the gala. For more information about the gala or accommodations, contact Dr. Barry Dolman before March 1st at drdolman@sympatico.ca.

U of T Class of 60 Reunion

The University of Toronto's dental faculty graduating class of 1960 will hold its 45th reunion dinner on May 4, 2005, in Toronto. For more information, contact Dr. Marvin Klotz, tel.: (416) 597-8675 (ext. 5), fax: (416) 597-8774, e-mail: dr.klotz@heredental.com.

Appointments

Health Canada Creates Chief Dental Officer Position

Dr. Peter Cooney

Dr. Peter Cooney has been appointed as the Chief Dental Officer for Health Canada. Dr. Cooney's main responsibilities will be to increase awareness about preventing oral diseases and to improve the oral health status of Canadians. One of Health Canada's goals in creating this new position is to provide evidence-based advice, through the gathering of epidemiological information, on oral health policy, program development and research. In its press release announcing the appointment, Health Canada highlighted the impact that good oral health habits can have on all Canadians. "The health of our teeth and gums," states the release, "provides a 'window' into the state of the health of our bodies."

Dr. Cooney was the director general of the Non-Insured Health Benefits Division of the First Nations and Inuit Branch from 1999 to 2003.

New Registrar in Nova Scotia

Dr. William MacInnis

Dr. William MacInnis is the new registrar of the Provincial Dental Board of Nova Scotia. Dr. MacInnis was dean of the faculty of dentistry at Dalhousie University for 10 years and is a past-president of the Nova Scotia Dental Association and the Association of Canadian Faculties of Dentistry. He also served on the Commission on Dental Accreditation of Canada and with the Canadian Forces Dental Services. Dr. MacInnis was in private practice in Halifax for 16 years.

NLDA Appoints New Executive Director

The Newfoundland and Labrador Dental Association (NLDA) has appointed Mr. Anthony Patey to the position of executive director. Mr. Patey had held provincial government positions before joining the NLDA, including terms as director of

Mr. Anthony Patey

Economic and Trade Analysis for the Department of Industry, Trade and Technology and director of Strategic Procurement with the same department. He most recently served as the director of Securities with the Securities Commission of Newfoundland and Labrador.

Obituaries

Cotter, Dr. Wilfred: A 1944 graduate of the University of Alberta, Dr. Cotter of Saskatoon, Saskatchewan, passed away on September 30, 2004. He was a life member of CDA.

Dickson, Dr. Ronald G.: A 1965 graduate of Creighton University in Omaha, Nebraska, Dr. Dickson of Calgary, Alberta, passed away on November 12. He was a life member of CDA.

Hill, Dr. Gordon: Dr. Gordon Hill of Rocky Mountain House, Alberta, passed away on October 27, 2004. He was a 1964 graduate of Marquette University in Milwaukee, Wisconsin.

Koblosh, Dr. Alexander: A 1974 graduate of the University of Western Ontario, Dr. Koblosh of Windsor, Ontario, passed away on October 16, 2004.

Krawchuk, Dr. Theodore: Dr. Krawchuk of Winnipeg, Manitoba, passed away on October 6, 2004. A 1953 graduate of McGill University, Dr. Krawchuk was a life member of CDA.

Lagasse, Dr. Guy G.: Dr. Lagasse of Edson, Alberta, passed away on October 18, 2004. Dr. Lagasse was a 1973 graduate of the University of Alberta.

Locke, Dr. Robert: A 1953 graduate of the University of Toronto, Dr. Locke of Oakville, Ontario, passed away on June 12, 2004.

Perenak, Dr. Don Michael: Dr. Perenak of Calgary, Alberta, passed away on October 24, 2004. He was a 1952 graduate of Washington University in St. Louis, Missouri.

Stirling, Dr. George C.: Dr. Stirling of Toronto, Ontario, passed away in October 2004. Dr. Stirling was a 1960 graduate of the University of Toronto.

Stone, Dr. Lynn Hardy: Dr. Stone of Stony Plain, Alberta, passed away on November 7, 2004. He was a 1977 graduate of the University of Kentucky in Lexington. Dr. Stone received the CDA Certificate of Merit in 1999.

Sylvestre, Dr. Viateur: Dr. Sylvestre of Montreal was a 1943 graduate of the University of Montreal. He was a life member of CDA.

White, Dr. Earle A.: A 1950 graduate of McGill University, Dr. White of Penticton, B.C., passed away on August 18, 2004.

For direct access to the Web sites mentioned in the News section, go to the February *JCDA* bookmarks at http://www.cda-adc.ca/jcda/vol-71/issue-2/index.html.

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Elastomeric Impression Materials

In prosthodontics, impression materials are used to record intraoral structures for the fabrication of definitive restorations. The accuracy of these final restorations is highly dependent on the impression materials and techniques utilized. Elastomeric impression materials (addition silicones and polyethers) offer high elastic recovery and acceptable flexibility on removal of the impression from the mouth.

Recently, new elastomeric impression materials with very high elastic recovery and high tear strength have been introduced.

Addition silicones (polyvinylsiloxanes) have a moderately low-molecular weight silicone that contains silane groups. Since addition silicones do not produce a volatile by-product during polymerization, very small dimensional changes occur on setting. Hydroxide groups in many products produce hydrogen gas, resulting in small bubbles on the model surface if pouring is not delayed by 30-60 minutes. Many of these addition silicones contain catalysts like palladium that absorb this hydrogen. Newer addition silicones have been formulated to be more hydrophilic.

Polyethers are composed of a moderately low-molecular weight polyether, a silica filler and a plasticizer. When mixed, rubber is formed by a cationic polymerization process. Polyethers have excellent dimensional stability. They also have excellent wettability, resulting in minimal voids and excellent reproduction of detail.

Desirable Features

- Low viscosity – injectable
- Heavy viscosity – tray
- Automix, easy to use
- 4-minute working/setting time
- Ability to be disinfected
- Compatible with cast/die materials
- Adequate shelf life
- Cost-effective
- Distinctive color contrast between light- and heavy-body viscosities

Critical Properties – Clinical Significance

Wettability An impression material should have intimate contact with the tooth and underlying soft tissues and should not form bubbles or voids. Wettability is best with a hydrophilic material. Material should possess ability to displace moisture.

Flexibility Flexible impressions are easier to remove from the mouth when set.

Elastic Recovery A set impression must be sufficiently elastic so that it will return to its original dimensions without significant distortion upon removal from the mouth.

Tear Strength Adequate tear strength is important. Thin areas of material must resist tearing upon removal from the mouth and when separating the model and the impression.

continued on page 88

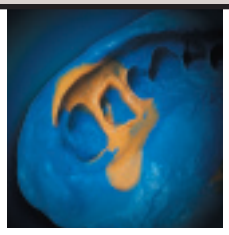
Rating Elastomeric Impression Materials

Product	Company	Working Time, min	Time in Mouth, min	Elastic Recovery	Flexibility	Tear Strength	Cost, US $/ml*	Rating
Addition Silicones – Light-body								
AFFINIS	COLTENE/WHALEDENT	1.0	2.0	Very High	Low	Low-Medium	0.34	92%
AFFINITY (Regular Set)	CLINICIAN'S CHOICE	1.75	2.5	Very High	Low	Medium	0.35	na
AQUASIL ULTRA XLV	DENTSPLY/CAULK	2.25-2.75	5.0	Very High	Low-Medium	Very High	0.43	93%
AQUASIL ULTRA LV	DENTSPLY/CAULK	2.25-2.75	5.0	Very High	Low	Very High	0.43	93%
CORRECT PLUS - THICK N' THIN	PENTRON	1.5	3.0	Very High	Low	High	0.17	91%
EXAFAST NDS	GC AMERICA	1.0-1.20	1.5	Very High	Low-Medium	Low-Medium	0.26	93%
EXAMIX NDS	GC AMERICA	2.25	4.0	Very High	Low-Medium	Low-Medium	0.26	91%
FLEXITIME CORRECT FLOW	HERAEUS KULZER	2.5	5.0	Very High	Low-Medium	Medium	0.31	97%
1st IMPRESSION PVS (Fast Set)	DEN-MAT	1.25	2.25	High	Low	Medium	0.27	na
1st IMPRESSION PVS (Regular Set)	DEN-MAT	2.5	4.5	Very High	Low	Medium	0.27	na
GENIE (Fast Set)	SULTAN CHEMISTS	1.4	2.8	Medium-High	Low	—	0.17	96%
GENIE (Regular Set)	SULTAN CHEMISTS	2.25	4.5	High	Low	—	0.17	96%
HONIGUM	ZENITH/DMG	2.25	3.5	Very High	Low	Low-Medium	0.63	96%
IMPRINT II GARANT	3M ESPE	1.0	4.0	Very High	Low	Medium	0.41	ce
TAKE 1 WASH	SDS/KERR	2.0	3.0	Very High	Low-Medium	Low-Medium	0.30	na
VIRTUAL (Fast Set)	IVOCLAR VIVADENT	1.55	2.5	Very High	Low	Medium	0.34	96%
Addition Silicones – Heavy-body								
AFFINIS	COLTENE/WHALEDENT	1.0	2.5	Very High	Very Low	Medium	0.46	92%
AFFINITY (Regular Set)	CLINICIAN'S CHOICE	1.75	2.5	Very High	Low	High	0.35	na
AQUASIL ULTRA HEAVY	DENTSPLY/CAULK	2.25-2.75	5.0	Very High	Low	High	0.43	93%
AQUASIL ULTRA RIGID (Fast Set)	DENTSPLY/CAULK	1.25-1.75	3.0	Very High	Very Low	Medium	0.43	93%
CORRECT PLUS - TRAY	PENTRON	1.5	3.0	Very High	Very Low	Medium	0.17	91%
EXAFAST NDS	GC AMERICA	1.25	1.5	Very High	Low	High	0.26	93%
EXAMIX NDS	GC AMERICA	2.0	4.0	Very High	Low	High	0.26	91%
EXAJET (Fast Set)	GC EUROPE N.V.	1.5	2.5	Very High	Low	Medium	0.43	ce
EXAJET (Regular Set)	GC EUROPE N.V.	2.0	3.0	Very High	Low	Medium	0.43	ce
FLEXITIME HEAVY TRAY	HERAEUS KULZER	2.5	5.0	Very High	Very Low	Medium	0.31	97%
1st IMPRESSION PVS (Fast Set)	DEN-MAT	1.25	2.25	Very High	Very Low	Medium	0.27	na
1st IMPRESSION PVS (Regular Set)	DEN-MAT	2.5	4.5	Very High	Very Low	Medium	0.27	na
GENIE (Fast Set)	SULTAN CHEMISTS	1.4	2.8	High	Low	—	0.17	96%
GENIE (Regular Set)	SULTAN CHEMISTS	2.25	4.5	Very High	Low	—	0.17	96%
HONIGUM	ZENITH/DMG	2.25	3.3	Very High	Very Low	High	0.39	96%
IMPRINT II PENTA	3M ESPE	2.0	4.0	Very High	Low	Very High	0.38	ce
TAKE 1 TRAY	SDS/KERR	2.0	3.0	Very High	Low	Very High	0.30	na
VIRTUAL (Fast Set)	IVOCLAR VIVADENT	1.25	2.5	Very High	Low	Medium	0.34	96%
Polyethers – Light-body and Heavy-body (respectively)								
IMPREGUM GARANT SOFT	3M ESPE	2.0	3.5	High	Low-Medium	Low-Medium	0.50	93%
IMPREGUM PENTA SOFT	3M ESPE	2.5	3.5	High	Low-Medium	High	0.42	93%

**Costs are listed for comparison only and are not used to calculate ratings.* *ce = currently evaluating* *na = not available*

THE DENTAL ADVISOR Recommends: Addition Silicones – ***Flexitime, Genie, Honigum, Virtual,*** Polyether – ***Impregum***

Honigum and MixStar
(Zenith/DMG)



Virtual
(Ivoclar Vivadent)

Impregum Penta and Garant Soft Polyether Impression Materials
(3M ESPE)

1st Impression Materials
(Den-Mat)

Elastomeric Impression Materials *continued*

Dimensional Stability Minimal dimensional changes that result during polymerization and prior to casting of the impression are desired. In addition silicones, these changes are small resulting in a dimensionally stable impression that is usable for weeks.

Detail Reproduction An impression material must reproduce even the finest of details and transfer these details accurately to gypsum, metal or polymer dies.

Steps for a Flawless Impression Procedure

Tips for the Dental Assistant

- Apply the correct adhesive to all internal surfaces and perimeter of the impression tray and let dry.
- Express a small amount of material from the automix cartridges before placing the tip.
- Keep the tip of the syringe buried in the expressed material during loading to minimize bubbles.
- Pay strict attention to working time. Viscosity increases with time reducing flow and detail production.
- Working and setting times are shorter in higher temperature and humidity.

Tips for the Clinician

- Select a tray of adequate size and extension. Provide occlusal stops if needed.
- Seat the loaded tray in a timely fashion. Once the material becomes rubbery, movement of the tray will cause internal stresses leading to an inaccurate impression.
- Removal of the impression too early will cause significant distortion.
- If using a closed-bite tray, be careful to avoid burn-thru, which can create distortion of the impression and produce less than ideal final restorations.

Clinical Notes

Sources of Impression Distortion

- Anatomical irregularities in the mouth (e.g., tori) can interfere with and distort the closed-bite tray.
- If a patient has a very strong tongue, avoid using a closed-bite tray because of an increased chance of distortion, especially for lower impressions. In this case, a quadrant tray usually works well.
- Patients with retained wisdom teeth are usually not good candidates for taking impressions with posterior closed-bite trays. Because of lack of space, proper closure is difficult, often resulting in inaccurate articulation. Anterior closed-bite trays work well for these patients.

Packing the Tissues

- Use a small diameter cord #00 followed by #0 cord (***Ultrapak***/*Ultradent*).
- Pack and keep in place for about five minutes.
- Keep area very dry to avoid dilution of chemicals or displacement of cords.
- Moisten the field before removal of the #0 cord, rinse well and make the impression.
- Remove the #00 cord before temporization.

Alternatives to Packing Tissue

- Isolate the prepared tooth.
- Inject impression material containing expansive and hemostatic properties around sulcus (***Expa-syl***™/*SDS/Kerr*).
- Have patient bite on dry cotton or into previously fabricated and hardened bite registration.
- Keep in place for five minutes.
- Remove immediately prior to taking impression.

Astringents

- To control hemostasis, an effective hemostatic agent is a ferric sulfate solution (***ViscoStat***/*Ultradent*; ***Cut-Trol***/*Ichthys*).
- Pack a dry cord and then apply the ferric sulfate solution.
- Rinse the site thoroughly, since the ferric sulfate solution can interfere with the setting and accuracy of addition silicone impression materials. ■

EXAFAST NDS
(GC America)

EXAMIX NDS
(GC America)

EXAJET
(GC Europe N.V.)

Imprint II Penta and Garant Vinyl Polysiloxane Impression Materials
(3M ESPE)

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Abridged Version

The complete article can be viewed on the **eJCDA** *Web site at: http://www.cda-adc.ca/jcda/vol-71/issue-2/91.html*

This article has been peer reviewed.

Over the past decade, the use of mobile dental service units has emerged as a practical strategy to address the issue of senior citizens' lack of access to comprehensive dental care. Many older people are unable to access dental care for reasons related to availability, affordability and other factors. Comprehensive, on-site dental services are not available in many institutional settings. The need for solutions to this problem is becoming more acute each year as the population ages and the number of people who live in collective households (e.g., nursing homes) increases. More diligent attention to the oral health needs of patients in long-term care (LTC) facilities is required because of the potential for poor diet and immunosuppression in this setting. In Ontario, the government has set standards for the oral health care of elderly patients; however, the standards are not always met for a number of reasons, such as insufficient staffing, poor staff education and low levels of government funding.

Different service models have emerged in Canada and the United States offering various levels of dental care to the elderly population. This article describes one model of delivering dental services to elderly patients: the mobile unit. This type of unit, which is operated as an adjunct to the general practitioner's office, relies mainly on existing office resources to deliver services at LTC institutions. The essential components of a profitable geriatric mobile unit are described, including education, equipment, marketing research and development, and human resource management. Issues related to patient consent and operating expenditures are also discussed. Data from one mobile dental unit operated by a practitioner in Ontario are presented to demonstrate the feasibility and profitability of this approach to service delivery.

The delivery of mobile dental care to elderly people requires an interdisciplinary effort and involves dental staff, nursing staff, primary care physicians, resident representatives and third-party payers. The mobile dental team (dentist, hygienist, office staff) must assist in establishing a preventive program, provide education for nursing staff and participate in the medical and dental management of medically compromised patients. Before initiating a mobile dentistry practice, dentists are encouraged to investigate the nursing homes and chronic care hospitals in the area and establish one institution as the centre of the mobile practice. The central LTC facility should have enough residents to provide a steady client base and make the coordination of patient services, staff education and marketing of services to families more manageable. In time, services offered might include care for homebound patients who come for outreach programs as well as participants in community daycare programs and residents of nearby retirement homes. Before embarking on a geriatric dentistry practice, the practitioner must develop an understanding of the aging process and learn how to interact with elderly patients. The resources required for this type of practice, in terms of both equipment and staff, are generally the same as those found in an existing office-based clinic. Careful planning and organization of these resources, coupled with targeted marketing, can make mobile dentistry a profitable practice. ◆

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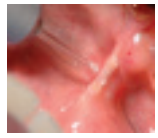
General Restorative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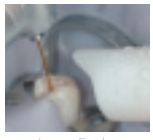
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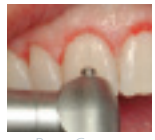
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Does Dental Disease Hurt Your Heart?

• **Sara C. Gordon,** BSc, BA, DDS, MSc, FRCD(C) •
• **Andrei Barasch,** BA, DMD, MDSc •
• **W. Choong Foong,** BSc (Hons), PhD •
• **Ahmed K. ElGeneidy,** BDS, DOS, MScD, DScD, DDS, FDSRCS •
• **Monika M. Safford,** BA, MD •

Abstract

Recent research has yielded conflicting data regarding the relationship between dental disease, particularly periodontitis, and cardiovascular disease. A causative relationship would have major ramifications for health care. There is a plausible theoretical basis for such a link, as increased levels of inflammatory mediators may increase the risk of atherosclerotic plaque formation. Nevertheless, a clinical confirmation of a causative relationship has been difficult, in part because cardiovascular disease and periodontal disease share common risk factors such as increasing age and tobacco use, and because cardiovascular medications may increase the risk of periodontitis. Patients should be encouraged to control documented risk factors for cardiovascular disease and to maintain oral health for its well-known health benefits.

MeSH Key Words: *coronary disease/epidemiology; focal infection, dental/complications; periodontitis/epidemiology; risk factors*

© J Can Dent Assoc 2005; 71(2):93–5
This article has been peer reviewed.

What can a clinician say to patients who may be contemplating radical measures to eliminate dental disease as a means of controlling their risk of heart disease? Can dentists advertise control of oral disease as "good for your heart"? Can dental professionals take partial credit for the contemporary decline in the prevalence of and mortality caused by cardiovascular disease (CVD)? The jaw bone–hip bone connection has been the subject of intense research, discussion and controversy for the last decade or so. We review here the literature about this topic and discuss current answers to these questions through a critical evaluation of the available evidence.

Dental diseases are the most common infectious diseases in the world.[1] A number of studies in recent years have attempted to examine the potential relationship between dental diseases and CVD. These studies have been the subject of controversy, yet they have received considerable publicity in both the lay and medical press. For example, the American Heart Association states that "While there are conflicting data regarding this hypothesis, no substantial evidence has been presented that oral microorganisms are etiologic for cardiovascular disease, nor that they cause or exacerbate acute cardiovascular events such as myocardial infarction, stroke, unstable angina or death."[2] Nevertheless, the American Dental Association published a special supplement in June 2002 entitled "Oral Health, Heart Health."

The implications of a direct link between oral infections and CVD are numerous, and may have a significant effect on public health in North America. If such a connection is indeed accepted, we may change the way we prevent or treat CVD, which is still the leading cause of mortality on the continent. We may also radically change the way we perceive dental care, and this in turn may have major implications for the relationship between dentistry and medicine, as well as between dental insurance and medical insurance.

What Is the Postulated Link?

It is biologically plausible that oral, in particular periodontal, disease may increase the risk of CVD. Beck and others[3] hypothesized that periodontal disease, through its mostly gram-negative pathogens, provides a biological burden of endotoxin (lipopolysaccharide [LPS]) and inflammatory cytokines, which may initiate and exacerbate atherogenesis or thromboembolic events. Similarly, in 1998 Page[4] suggested that LPS and gram-negative oral bacteria

may enter the bloodstream and increase susceptibility to systemic diseases. He emphasized the possible role of inflammatory cytokines produced in response to chronic periodontal infection in systemic events like platelet aggregation, thrombosis and formation of atheroma. Herzberg and Weyer[5] agreed, and in an animal model, determined that plaque bacteria may induce platelet aggregation. Lowe[6] pointed out that hemostatic and rheological variables are associated with both prevalent and incident CVD, and may be mechanisms through which risk factors such as smoking, hyperlipidemia and infections, including oral infections, promote vascular events. Kinane[7] proposed that the 2 main processes linking periodontitis and atherosclerosis are LPS-related responses and the hyperresponsive-monocyte phenomenon. However, they concluded that the evidence was insufficient at present and that more study was needed.

Oral pathogens are not the only bacteria that have a postulated link to the development of atherosclerosis. *Chlamydia pneumoniae* and *Helicobacter pylori* are also suspected infectious agents in atherogenesis. However, evidence linking *C. pneumoniae* to CVD is contradictory.[8,9] Whincup and others[10] found only a weak association between infection with *H. pylori* and CVD in a study that controlled for tobacco use.

Additional studies to connect oral disease and CVD have been done with surrogate markers for the latter. Danesh and others[11] reviewed inflammatory markers that have been associated with coronary heart disease and concluded that fibrinogen, C-reactive protein (CRP), albumin levels and leukocyte counts are associated with risk of coronary heart disease. This was further substantiated by Ridker and others.[12] Fredriksson and others[13] found that CRP levels were higher for patients with periodontal disease and that periodontal lesions may induce hyperreactivity in neutrophils. Noack and others[14] also found a positive correlation between CRP levels and periodontal disease. Although these findings do not prove a cause–effect relationship, they do contribute to the circumstantial evidence of a connection between oral and cardiovascular diseases, and point to possible mechanisms of interinfluence.

Other comorbid conditions were also studied. Anemia increases the risk of a cardiovascular event. Hutter and others[15] suggested that patients with periodontitis had lower hematocrit and hemoglobin levels after adjustment for confounders. However, analysis of the data of this study by Merchant[16] suggested that differences in risk factors for anemia had not been completely adjusted for.

Hypercholesterolemia is another cardiovascular risk factor.[17] Katz and others[18] demonstrated that patients with this condition have more severe periodontal disease, although the same association was not seen between high triglyceride levels and periodontitis.

Upper body obesity, another risk factor for CVD, was associated with periodontitis in 643 healthy dentate Japanese subjects by Saito and others,[19] who earlier reported an association between periodontitis and body mass index. Abdominal obesity has been linked with increased CRP and inflammatory cytokine levels, as well as other risk factors for CVD. In an analysis of this study, Ritchie[20] stated that "their study shows that failure to measure and adjust for this variable in periodontitis-systemic disease relationships could potentially distort the true association."

What Have Clinical Studies Shown?

Mattila and others[21] first reported an association between poor dental health and heart attack in a case-control study comparing 100 patients with acute myocardial infarct and 102 community members. DeStefano and others[22] found that patients with periodontitis had a 25% increased risk of coronary heart disease, and that men under 50 who developed periodontal disease had a relative risk of 1.72 for coronary heart disease. They also suggested that the risk of total mortality was associated with the severity of periodontal disease. Mendez and others[23] found a 2.27 increment in the risk of peripheral vascular disease among U.S. veterans with clinically significant periodontal disease. Loesche and others[24] found that the rate of cerebrovascular accident (stroke) was associated with many indicators of dental disease such as plaque index, oral neglect and oral hygiene, and was inversely associated with salivary flow. Arbes and others[25] examined data from the National Health and Nutrition Examination Survey (NHANES) for 5,564 adults and found that the adjusted odds ratio for self-reported heart attacks was 3.8 among patients who had loss of periodontal attachment greater than 3 mm at 67% or more of the sites. Wu and others[26] examined NHANES data for 9,962 adults and suggested a relative risk of 2.11 for cerebrovascular disease among patients with periodontitis and 1.41 among edentulous patients. Buhlin and others[27] found that CVD and hypertension were associated with gingival bleeding, and CVD was associated with wearing dentures, after adjustment for potential confounders.

The debate about whether periodontal disease is a risk factor for cardiovascular disease is still unresolved.

A recent study by Meurman and others[28] found poorer oral health in 256 patients with severe heart disease than in 250 controls without coronary heart disease. They found that the levels of inflammatory markers were consistently higher among patients with coronary heart disease. The difference in CRP and fibrinogen values between the group with coronary heart disease and the group with

noncoronary heart disease was significant, but the difference in white blood cell counts was not. Serum *H. pylori* and *C. pneumoniae* antibodies were also significantly higher for patients with coronary heart disease. The authors suggested that acute soft-tissue inflammation, such as gingivitis, pericoronitis or remaining root tips, may contribute more to the levels of inflammatory cytokines than to a single chronic pathologic process, such as periodontitis, which is often subclinical. They also noted that patients with coronary heart disease were more likely to be hypertensive and that many hypertension medications cause xerostomia, which in turn promotes oral disease. This study did not, however, adjust for the effects of smoking on oral health, in particular on periodontitis.

Conversely, Joshipura and others[29] found no significant association between periodontal disease and coronary heart disease in a study of 44,119 adult U.S. males. Hujoel and others[30] looked at NHANES data for 636 patients with CVD and found no relation between CVD and the presence of periodontitis or gingivitis. In 2002 Joshipura and Douglass[31] reviewed cohort studies of periodontal disease and tooth loss in relation to coronary heart disease or stroke, and found that the adjusted relative risk ratios were low (range 1.01–1.37).

Perhaps more revealing, a prospective longitudinal study[32] with 12 years of follow-up that used univariate analyses to examine data for over 6,500 subjects showed that oral diseases were associated with CVD. However, adjustment for well-known risk factors, such as smoking, obesity, hypertension and age, reduced all the associations to statistical insignificance.

Finally, a meta-analysis of data about the relationship between periodontal disease and CVD showed only a modest increase in the risk ratio.[33] However, this study used highly restrictive inclusion of data, leaving out all cross-sectional trials and those that had fewer than 100 patients.

So What Does It All Mean?

The debate about whether periodontal disease is a risk factor for CVD is interesting, but still unresolved.

Although some studies have demonstrated that the relative risk for CVD is increased among patients with periodontitis, some analyses have been potentially confounded by the fact that smoking and diabetes seem to have a causal relationship with both CVD and periodontitis. Additionally, many cardiovascular medications cause hyposalivation, which is associated with an increased risk of dental disease.

All in all, it is plausible that oral inflammatory cytokines and immune activation directly affect the vasculature located only a few centimetres away. It is also conceivable that frequent bacteremia (caused, for example, by chewing and tooth brushing) could induce hypercoagulable states. However, as long as the mechanism of CVD remains obscure, it will be difficult to determine the real relationship between oral and cardiovascular disease.

Even though definitive proof is currently elusive, patients should be strongly encouraged to prevent and treat all oral diseases, including periodontal disease. One of the most important steps a patient can take to prevent CVD is to abstain from smoking — smoking is an acknowledged risk factor in the development of oral disease.[34]

Conclusions

The relationship between oral disease and CVD remains controversial. Based on current evidence, periodontal and other oral disease may have at best a modest correlation with the development of CVD and resulting mortality. The biological mechanism for such a correlation has not been elucidated. Patients should be encouraged to concentrate on controlling well-known risk factors for CVD and to seek the well-documented benefits of treating dental disease: freedom from pain and infection, improved chewing ability, improved esthetics and control of halitosis. ◆

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Lingual Orthodontics: History, Misconceptions and Clarification

• **Paul H. Ling,** DDS, MDS, MOrthRCS •

Abstract

Many frank misconceptions still exist surrounding the efficacy and clinical nature of lingual orthodontics, which were first introduced over 25 years ago in Japan and the United States. Despite early difficulties in the development of the technique, it has become a valid clinical option for patients in many parts of the world. Specific problems, for example concerning patient comfort and biomechanics, have been systematically solved over time. Continuing modification of clinical methods significantly increases options for clinicians and patients, especially adults who may be reluctant to accept traditional labial orthodontic appliances.

MeSH Key Words: *esthetics, dental; orthodontic brackets/history; orthodontics, corrective/instrumentation*

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Since the earliest fixed lingual orthodontic appliances appeared in the mid- to late 1970s,[1–4] they have been subject to significant vicissitudes.[5–8] Beginning in 1979, an initial wave of popularity occurred when the first mass-manufactured lingual brackets were released in the United States. At that time, the media and public had been made aware, rather suddenly, of a new technique that would allow straightening of teeth, *without* the requirement for traditional labial "outside braces" (**Figs. 1** and **2**). No matter how vigorously esthetic labial brackets (e.g., plastic, polycarbonate, vinyl and ceramic brackets) or other moderately effective alternatives (e.g., Invisalign [Align Technology Inc., Santa Clara, Calif.] have been promoted over the years, many adults do not seek orthodontic treatment because of the perceived embarrassment of wearing braces.[9]

The earliest consistently documented work on lingual appliances began around 1975,[10,11] when 2 orthodontists working independently in Japan and the United States started developing their own systems to place braces on the *inside* surfaces of the teeth. The early prototypes were based on modified, traditional "outside" braces. Much credit has been given to the late Dr. Craven Kurz of California, who with co-workers developed the early Kurz/Ormco lingual bracket system. However, over the same period, significant development was made by Professor Kinya Fujita, of Kanagawa Dental University in Japan, who continues to make great advances in this clinical discipline.

Why Lingual Orthodontics Developed Slowly in North America

Clinical protocols had not been fully elucidated in those early days, resulting in many clinicians feeling impelled to begin lingual orthodontic cases without being fully prepared. Orthodontists found that the new lingual technique required much more rigorous attention to detail, as well as a fundamentally different approach to treatment planning and biomechanics. Postural challenges associated with potential back pain and related discomfort may have discouraged many operators — although these difficulties were overcome with practice and enhanced efficiency of clinical technique — resulting in the abandonment of many early lingual orthodontic treatments, which were completed with labial appliances.[10] An early generation of frustrated clinicians came to believe that accurate, efficient lingual orthodontic treatment was an inherent paradox — much like earlier views that achieving manned flight was impossible.

Many negative perspectives continue to be propagated, particularly in North America. Thus, much of the long-term development of lingual orthodontic therapy has occurred in other parts of the world, including Japan and Italy,[11] France,[7,12] Korea,[13,14] Germany,[15] Singapore and

Figure 1: *The visual appeal of concealed lingual orthodontic appliances is obvious, especially compared with an earlier fully banded labial orthodontic appliance (**Fig. 2**). Even modern bonded clear labial brackets hold limited esthetic appeal for many people.*

Figure 2: *Fully banded labial orthodontic appliance.*

Figure 3: *A clinical view of the Ormco 7 lingual apparatus, an American design. Note the complete absence of attachments on the labial and buccal surfaces.*

Figure 4: *Indirect lingual bonding is accomplished using transfer trays to orient the brackets on the teeth. One latest method, developed in Korea, uses an individual resin tray for each tooth to ensure maximum efficiency for initial bonding and re-bonding when necessary.*

Figure 5: *This adult patient presented with a Class II, division 2 malocclusion. Note the almost complete anterior overbite.*

Figure 6: *With fixed appliances bonded, the lower incisal edges are contacting the upper lingual brackets. There is no contact between the upper incisal edges and the lower brackets.*

Australia,[8,16] Turkey,[17] Israel[10,11,18] and South Africa, although there are a few dedicated practitioners in the United States.

The Current State of Clinical Applications

Ormco lingual brackets (**Fig. 3**) are currently in their seventh iteration (hence, Ormco Generation 7 brackets [Sybron Dental Specialties, Orange, Calif.]). They have been in use since about 1990 and continue to be widely used throughout the world. No substantive modifications to the design have been released since the early 1990s. They are compact and relatively simple for patients to wear, although they are not the only design available.

Objections to the concept of lingual orthodontic treatment are still occasionally raised, often by non-practitioners of the technique. For example, there is a perception that the length of treatment with lingual appliances is excessive compared with that for labial appliances. Students of orthodontic history may recall analogous debates beginning in the 1930s between the radical non-extraction lobby led by Dr. Edward Angle and the group under Dr. Charles Tweed, which advocated judicious selection of extraction patterns.[19] Despite the acrimony of the time, the latter faction's work led directly to the development of standard edgewise mechanics, which in turn laid the groundwork for the modern straightwire appliance. In other quarters, the efficacy and nature of functional appliances has also been, and occasionally continues to be, hotly debated.

Despite early resistance, "new" techniques such as these have eventually become proven and have moved from the margin to the mainstream. There seem to be only rare instances in which candid admissions have been made exposing the convenience of the standby "old excuse that treatment time would be considerably longer."[20] While pundits may attempt to deflect patient interest in many a new clinical method in this fashion, there is no objective evidence to suggest that lingual orthodontic treatment should take any longer for a given case than labial orthodontic treatment.

Is Treatment Quality Comparable to Labial Orthodontics?

Literature review fails to reveal any objectively quantified evidence that lingual orthodontic mechanics are inherently slower or less precise in achieving dental alignment.[18,21] Anecdotal reports, possibly influenced by individual bias, are not new. For example, when the first usable ceramic brackets were released during the early 1980s, it was suggested that it

Figure 7: *An occlusal view (later in treatment) demonstrates the shape of the upper lingual brackets, which act effectively as a bite plane against the lower incisors.*

Figure 8: *Only archwire mechanics were used to close the buccal segments in this combined lingual-upper, labial-lower case. No acrylic bite planes, interarch elastics, or other auxiliaries were required.*

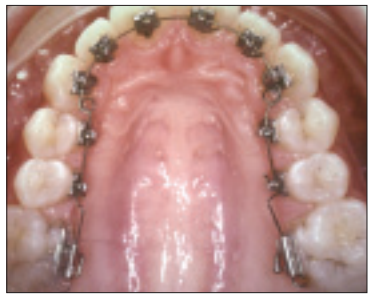

Figure 9: *The Begg technique was developed in Australia and is almost unknown in North America. Here labial Begg appliances have been modified to the lingual aspect.*

Figure 10: *The most current Fujita bracket system is most commonly used in Japan and Korea; it allows the possibility of combining straightwire mechanics with elements of the Begg technique and other approaches.*

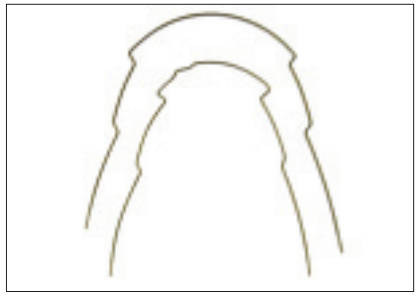

Figure 11: *Special archforms are often employed and can be more complex than those for labial appliances.*

Figure 12: *The Stealth bracket is a new design. Other prototypes are being developed with self-ligation in mind.*

was "impossible" to direct-bond ceramic brackets accurately owing to their intrinsic transparency and the reflection of light that purportedly obscured landmark recognition.[22]

Despite some early trepidation, the direct bonding of ceramic brackets quickly became accepted practice. As a further note, because the advent of early ceramic brackets (e.g., the Starfire ceramic system [Sybron Dental Specialties], among others) coincided roughly with the arrival of early lingual appliances, many clinicians at that juncture turned away from primordial lingual appliances in favour of labial ceramic brackets, notwithstanding short-lived objections such as that cited above.

Precision of bracket placement (and, therefore, final clinical results) has been addressed primarily by the use of indirect lingual bonding (**Fig. 4**). The laboratory protocols for fabrication of transfer trays have been a standard feature of most lingual orthodontic styles of practice since the beginnings of the discipline. Direct bonding is possible, but rarely implemented.

Another commonly held misconception centres around the assumed problem of bracket interference in cases of deep overbite.[17] The earliest lingual bracket designs incorporated a built-in bite plane within the body of the upper anterior brackets.[10,11,23] The clinical case shown (**Figs. 5–8**) demonstrates the initial "propping open" effect elicited by the presence of lingual upper appliances against lower incisors, with subsequent posterior bite closure. Curiously, critics of this aspect of the lingual appliance seem to overlook the impingement inherent in similar cases between lower labial brackets and the incisal edges of the upper anterior teeth.

The Patient's Perspective

Early objections regarding the comfort of lingual appliances have been overcome with time and the establishment of clinical approaches that generally do not exist in labial orthodontics. For example, the use of removable silicone pads, soft thermoplastic splints and other devices has been developed to the point of routine use, where needed, to accommodate speech and eating patterns in new patients with lingual appliances.[12,24]

Bearing in mind that many people tend to exhibit the maxillary canine to canine most prominently when smiling, it is possible to offer combination treatment in the form of lingual upper appliances and lower labial appliances. Such an approach achieves the desired result, along with more accessible patient fees. It is not unusual in this case for the fee to be roughly 1.5 times the usual labial orthodontic

fee, versus roughly twice the fee for a full bimaxillary lingual orthodontic set-up. Fees vary considerably, however, depending on the complexity of the individual case.

Innovations and Future Directions

Numerous orthodontists are continuing to adapt other lingual orthodontic systems to simplify some of the earlier methods used in "invisible" orthodontic treatment. Some of these are based on techniques that originated largely outside North America.

During the 1990s, working with colleagues in Australia and South Africa, I built on an Australian bracket design[4,8] to streamline the treatment process. The design (**Fig. 9**) is known as the Begg technique after its originator, the late Dr. P. Raymond Begg of Australia, and is used more commonly in parts of Europe, Australia, New Zealand, Southeast Asia, China and Japan. The laboratory set-up was simplified compared with the Generation 7 appliances, but clinical manipulation still required rather intricate procedures. The advantage for patients was more accessible fees for their lingual orthodontic treatment.

Another system I have used more recently is one originally pioneered by Professor Kinya Fujita of Japan (**Figs. 10** and **11**). Like most other lingual systems, it allows the use of complex archwire designs completely different from traditional labial braces, allowing notable flexibility and varied mechanics to suit any clinical situation.[13,14,25] For example, tandem archwires and vertical slot auxiliaries may be used. Current versions of the Fujita system are the result of over 25 years of design evolution and continue to address issues of patient comfort and biomechanical efficiency.

Still another highly promising, and more recent, lingual orthodontic technique has been developed by American Orthodontics Inc. (Sheboygan, Wis.). Stealth brackets (**Fig. 12**) combine elements of other orthodontic systems, such as vertical and horizontal slots, to allow edgewise archwires or archwire auxiliaries or both.

Many other orthodontists and I are still in the process of improving and evaluating lingual orthodontic methods. This work maintains the long-standing convention of continuous lingual research and development continued by orthodontists and other colleagues worldwide. ◆

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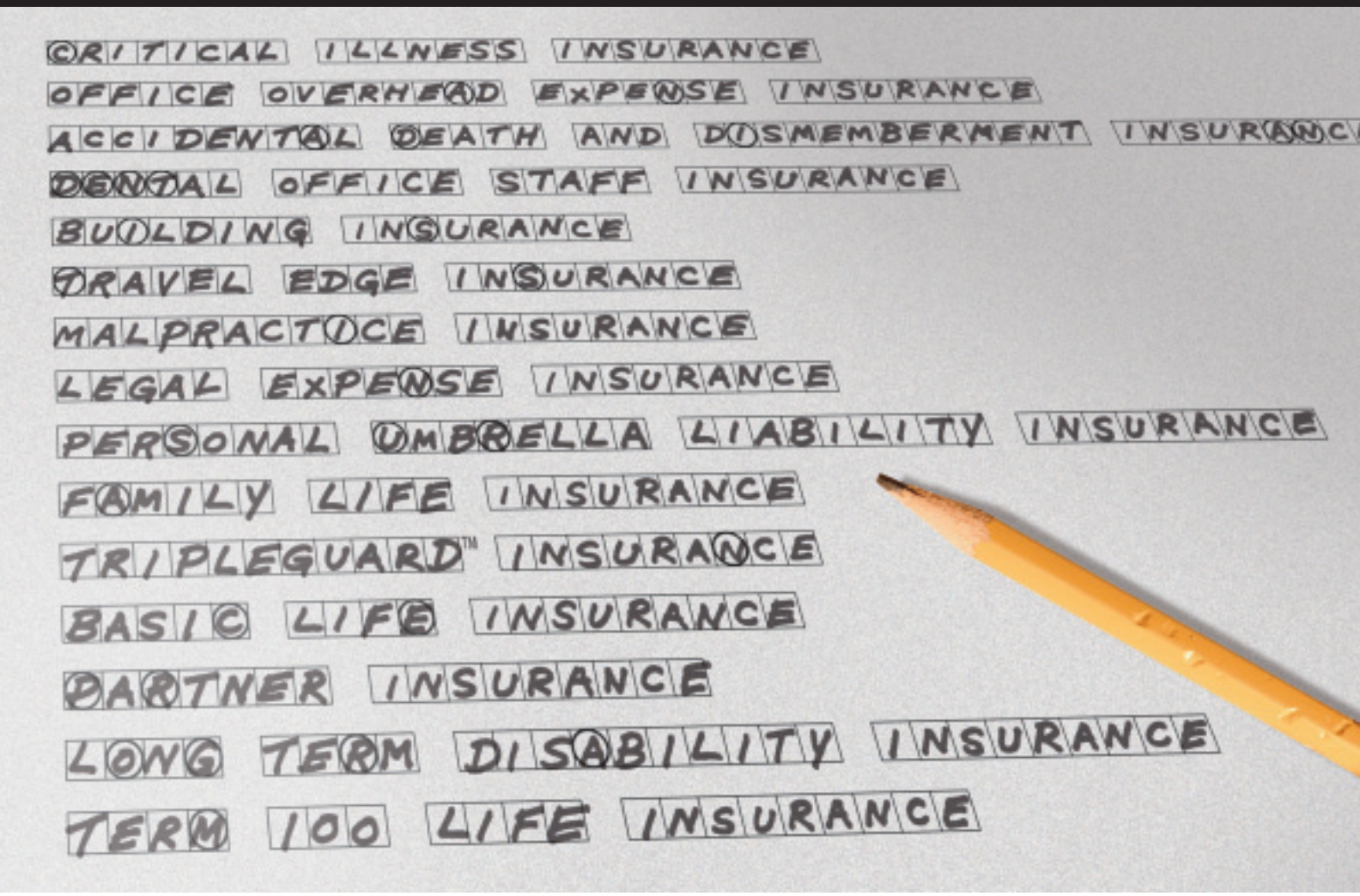

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Management of Patients with Foreign Body Gingivitis: Report of 2 Cases with Histologic Findings

• **Karl Gravitis,** BSc, DDS, Cert Perio •
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• **Marie A. Lochhead,** ASc, RDH •

Abstract

Foreign body gingivitis is an inflammation of the gingiva, characterized by foci containing particles of foreign material in the connective tissue, which can have either a granulomatous or a lichenoid microscopic appearance. In clinical terms, it differs from other immune-mediated gingival disorders in its limited involvement of tissues other than the gingiva, as well as its relative resistance to treatment by topical corticosteroids. Two cases are presented, with a review of the clinical features, including characteristic desquamation and mottling of the marginal gingiva and symptoms of localized tenderness and pain; gingival recession was observed in both of the reported cases. Histologic examination revealed damaged epithelium and degeneration of the basal layer, as well as a mixed inflammatory cell infiltrate in the connective tissue with refractile or opaque particles of foreign material. Gingival inflammation and the severity of gingival erosions improved dramatically with careful debridement, improved home care and more frequent, diligent periodontal maintenance therapy. Free gingival grafts, together with excision of affected tissues, served to stabilize and reinforce the marginal tissues, as well as eliminating further clinical signs of the disease; excision alone was not as effective. Patients require careful dental and periodontal management as well as appropriate oral home care to avoid further mechanical damage to the gingiva; in addition, the use of dental abrasives and polishing agents should be restricted, particularly if gingival lesions are present. Home care recommendations include avoidance of dentifrices with certain chemical additives and rinses with a high alcohol content.

MeSH Key Words: *case report; gingivitis/pathology; foreign bodies/complications; granuloma, foreign-body/complications*

This article has been peer reviewed.

Foreign body gingivitis (FBG) is an inflammation of the gingival tissues associated with the presence of foreign material in the gingival connective tissues.[1] Its clinical presentation is characterized by solitary or multiple red or red and white lesions, which may resemble and be mistaken for lichen planus; the affected tissues may appear ulcerated. The condition is much more common among women (mean age of 48 years), and patients may complain of swelling or pain in the region.[1,2] The lesions usually involve the marginal and attached gingiva; the interdental papillae are also commonly affected. In some cases the onset of lesions can be correlated with recent dental treatment involving the proximal use of dental restorative materials or dental prophylaxis agents. The condition often persists despite conventional periodontal therapy and excellent oral hygiene.[1]

Because the clinical appearance of FBG resembles that of other desquamative gingival disorders, a definitive diagnosis requires microscopic evaluation of the tissue, possibly supplemented by another form of analysis, to confirm the presence and nature of foreign materials. Histologic examination characteristically shows granulomatous inflammation, with an intense lichenoid lymphocytic infiltrate. There may be well-formed granulomas, sometimes containing multinucleated giant cells, or only focal collections of histiocytes.[1] Foreign bodies in the granulomas vary in size, but most are less than 5 μm in diameter. They may be opaque or refractile or both. The most frequently identified

element in the foreign material is silicon, followed by aluminum and titanium, with several other elements found in fewer specimens.[3] It has been suggested that FBG may be caused by the entry of dental materials into the connective tissues.[1–3]

Previous work indicates that the condition persists despite conventional periodontal therapy and excellent oral hygiene and that the only successful treatment for FBG is surgical excision of the affected tissues.[1] The clinical findings and treatment histories of 2 patients, presented here, provide some insight into the response of the affected tissues to periodontal therapies; suggestions for management of similar cases are also provided.

Case Reports

Case 1

The first patient was a 40-year-old female nonsmoker who was in good general health and was not using any prescription medications. For the 6 months preceding her referral to our office, she had reported acute soreness in the gum region and aggressive bleeding when she brushed her teeth. She usually visited her dentist every 3 to 6 months for scaling and prophylaxis. Her most symptomatic gingival regions were the labial areas of the anterior maxilla, and the mandibular buccal premolar areas. Because of these problems, she found home dental hygiene difficult and discouraging.

Oral examination revealed that the gingiva was irregularly mottled, with red and white patches; desquamation and marginal ulceration were present at many sites (**Fig. 1**). The interdental papillae were flattened or missing entirely in some areas. Plaque control was fair overall, but poor in the regions most affected, especially interproximally. Supragingival calculus was light, but subgingival calculus deposits were moderate in many interproximal areas. Pocket probing depths were up to 5 mm anteriorly and 6 mm for the interproximal areas between molars; bleeding on probing was generally significant and heavy in regions of marginal gingival ulceration. The gingiva at these sites was atrophic and poorly keratinized, with generalized labial and buccal recession; there was no attached gingiva remaining at several sites, and there was significant root exposure. There were a few localized mobilities, up to grade 1, with Class I buccal furcation involvements. Initial diagnosis was early to moderate periodontitis, with recession and inadequate attached gingiva, complicated by a desquamative gingival disorder, suspected to be erosive lichen planus.

Incisional strip biopsy of sore, red buccal gingiva was performed before initiation of periodontal debridement. Histologic examination showed fibrous connective tissue containing a patchy chronic inflammatory infiltrate consisting primarily of plasma cells, with pockets of lymphocytes. The overlying epithelium exhibited atrophy, with liquefactive degeneration of cells of the basal layer. Refractile fragments of foreign material were present within the connective tissue (**Fig. 2**). Topical use of a corticosteroid ointment (0.05% fluocinonide) was prescribed, to help relieve inflammation-mediated tissue pain; tenderness of the affected tissues improved with regular use of the medication, but tissue quality did not visibly change.

The patient's initial periodontal therapy consisted of quadrant root planing under local anesthetic, followed by appropriate instruction about oral hygiene. Instrumentation was thorough and definitive, but great effort was made to minimize soft-tissue trauma. Unfortunately, improvement in hygiene was incremental; therefore, a chlorhexidine rinse (0.12%) was also prescribed, to be used for 1 to 2 weeks after root planing. The response to initial therapy was good, with a significant reduction in general gingival inflammation, as evidenced by resolution of most of the severe initial gingival redness, swelling and soreness. The number of bleeding points, as well as the intensity of bleeding on probing, was significantly reduced. Some erythema of the marginal gingiva persisted in the anterior region and in many interproximal areas (most notably where the interproximal papillae were initially damaged).

Surgical therapy for this patient consisted of free gingival grafts for the areas judged to be most receded and unstable, the lower canine and premolar buccal regions. The posterior palatal gingiva was deemed clinically healthy and suitable as a donor site, as it showed no signs of inflammation or desquamation. Grafted sites healed well, and there was no evidence of recurrence of the initial gingival symptoms in the grafted areas up to 5 years later (**Fig. 3**). Two years after the initial procedures, the maxillary anterior labial and palatal gingiva still showed significant inflammation and ulceration. Because the mandibular gingival grafts had been so effective, a free gingival graft was also placed in this area (**Fig. 4**), in addition to labial gingival stripping (despite an adequate band of gingiva on the labial surface of the maxillary incisors). On the palatal aspect of this affected area, the tissue was thicker and more hyperplastic; therefore only a long-bevel gingivectomy was performed. Both sites initially healed well, but within a year much of the palatal gingiva exhibited recurrence of the initial redness, although signs of desquamation were reduced (**Fig. 5**). The labial aspect remained mostly free of inflammation.

The patient continued with a rigid maintenance schedule and was seen at the authors' office every 2 months. At the time of writing, 5 years after the surgery, the gingival tissues remain quite tender to the touch; therefore, topical or local anesthetic is applied liberally at each periodontal maintenance visit to allow adequate instrumentation. The tooth and root surfaces can be fully instrumented, but no dental polishing agents are used.

Case 1

Figure 1: *On initial presentation, there was significant gingival erythema, loss of interdental papilla and marginal ulceration.*

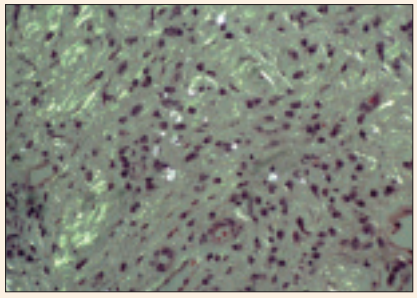

Figure 2: *Many of the foreign particles exhibited birefringence when viewed by polarized light; this appearance indicated a crystalline structure. (Hematoxylin and eosin, magnification ×150.)*

Figure 3: *Site of incisional biopsy (see* ***Fig. 2*** *for histology), 5 years after free gingival grafts were placed in the buccal region of teeth 33 and 34.*

Figure 4: *After root planing and placement of free gingival grafts for teeth 21 and 22 (labial surface), most of the initially damaged interproximal papilla between the central and lateral incisors has re-formed.*

Figure 5: *Residual inflammation and interproximal palatal ulceration, at 12 months after the gingivectomy procedures.*

Case 2

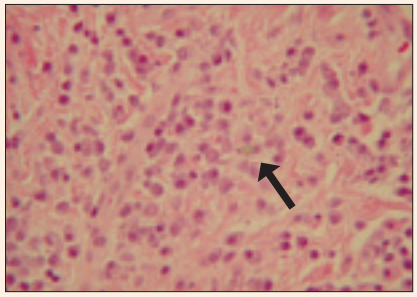

Figure 6: *Histologic examination of chronic inflammatory cell infiltrate shows plasma cells, lymphocytes and histiocytes. There is a large refractile fragment in the centre of the slide, which is about 5 µg in diameter. (Hematoxylin and eosin, magnification ×300.)*

Figure 7: *Six months after augmentation with a free gingival graft in the premolar area. The anterior region was treated similarly at a later date. There is minimal clinical evidence of inflammatory problems in the grafted area (despite the patient's limited ability to perform dental hygiene), whereas the untreated anterior tissue is atrophic and highly inflamed.*

Unfortunately, the patient's ability to perform oral hygiene remains a factor limiting overall periodontal stability, especially in the interproximal regions. The areas with the heaviest deposits appear to be positively correlated with sites of persistent FBG-type tissue response. When the patient experiences an increase in tissue soreness, she applies the corticosteroid ointment selectively. Attempts have been made to prolong the maintenance interval, but all of her gingival tissues appear to react strongly to moderate plaque accumulation.

Case 2

The second patient was a 45-year-old woman with a clear health history who was referred for management of persistent gingival inflammation and progressive gingival recession. She was undergoing scaling and prophylaxis at her general dentist's office every 6 months. She presented with multiple areas of gingival mottling, consisting of darker and lighter red patches, along with small ulcerations or desquamative areas, which were mainly visible marginally and interproximally; the most affected areas were the

anterior gingiva and the premolar buccal regions. Erosive lichen planus was suspected. Her chief complaint was of generally sensitive teeth, with some gum tenderness when she was brushing or eating hard foods; she had not noticed significant bleeding. Pocketing was minimal, but there was significant recession with exposure of roots, especially in the premolar and first molar areas. In these regions in particular, the gingiva was thin and poorly keratinized, and at several sites there was no attached gingiva remaining. The interproximal papillae were intact, without loss of interdental tissue (a feature that contrasted with case 1). Her oral hygiene at presentation was fair, with mostly soft deposits in the gingival third region; subgingival calculus was localized and moderate in the interproximal areas and on the lingual aspects.

At the start of periodontal therapy, an incisional strip biopsy sample was taken from the buccal marginal tissue most affected by the ulcerative lesions. The histologic report described a focally atrophic layer of parakeratinized and nonkeratinized squamous epithelium exhibiting reactive (inflammatory) changes. Focal absence of the basal cell layer was noted. The underlying connective tissue exhibited a mixed inflammatory cell infiltrate, consisting largely of plasma cells, lymphocytes and histiocytes. Numerous small particles of opaque foreign material, interpreted as dental prophylaxis paste, were present within the connective tissue (**Fig. 6**). The typical features of lichen planus were not seen.

Initial dental and root debridement was performed by half mouth, with local anesthetic. The patient's oral hygiene improved somewhat after extensive instruction, but has remained only fair subsequently. After root planing, the overall redness of the gingival tissues subsided significantly, but the uneven colouring or mottling of the gingiva persisted. No ulcerations could be seen clinically at this stage. Free gingival grafts were placed in the mandibular premolar buccal and anterior areas, which were the sites of the most severe and unstable recession (**Fig.** 7); these areas healed well, and there has been no progression of recession or recurrence of the ulcerations and redness. At the time of writing, the patient was attending maintenance visits every 3 months; the severity of the FBG type of gingival response becomes exaggerated if the maintenance interval is lengthened. She no longer complains of gingival soreness, but dental sensitivity continues because of the amount of root exposure.

Discussion

FBG should be included in the differential diagnosis of gingival disorders exhibiting desquamation or ulceration. Its clinical features may resemble those of oral lichen planus and other ulcerating immune mucosal conditions, but FBG pathosis tends to be limited to the gingiva, whereas lichen planus typically has a more migrating, widespread mucosal involvement. Localized swelling of the gingiva, often painful, should also alert the clinician to the possibility of FBG, especially if there is a red and white colouration to the tissue.[2] It is important to distinguish between various desquamative and lichenoid problems, so that the condition can be treated appropriately, and to rule out disorders with systemic ramifications and malignant or premalignant conditions.[4,5]

Previous authors have reported the persistence of FBG lesions despite conventional periodontal therapy and excellent oral hygiene.[1,2] Both of the patients described here exhibited only fair dental hygiene, and there were significant accumulations of hard and soft subgingival bacterial deposits. A more critical assessment of hygiene status, particularly of subgingival deposits and root roughness, is needed for patients with FBG and other desquamative gingival conditions. When oral hygiene measures are complicated by pain and bleeding, inferior plaque control is inevitable and must be counteracted by more thorough and frequent professional instrumentation, as well as oral hygiene measures tailored to the patient's specific needs. These observations are consistent with the suggested management of other desquamative gingival disorders.[6,7] The presence of dental plaque also adversely affects the course of oral lichen planus, and intensive oral hygiene procedures result in improvement in these lesions.[8,9]

Surgical excision of affected tissues has been the only recommended treatment for FBG.[1] Although gingivectomy or surgical stripping may be the best option, when thick or hyperplastic tissues are involved, overlaying the damaged sites with healthy gingiva may be a better option for persistently erosive areas or when the gingival complex is atrophic. In case 1, the labial maxillary gingiva, where a gingival graft was overlaid, remained much healthier than the palatal area of the same region, where only an excisional procedure was performed. It has been demonstrated that if healthy tissue is transplanted to an area of oral lichen planus, that area will remain free of lesions and appear clinically healthy.[10] In patients with lichen planus, free gingival grafts have been used successfully to reinforce marginal dental soft tissues and to help stabilize recession.[11,12] In cases of more severe gingival fragility, typically encountered in cases of cicatricial pemphigoid and epidermolysis bullosa, coverage of exposed roots may be possible.[13,14] The latter oral conditions, manifesting as desquamative gingivitis, have a systemic cause; therefore, finding donor tissues (for gingival grafting procedures) that are unaffected by the disease should theoretically be problematic. On the other hand, because the cause of FBG is more localized, gingival grafting with tissues taken from distant, unaffected sites should be successful.

The use of topical corticosteroids with other types of desquamative gingival conditions such as erosive lichen planus or cicatricial pemphigoid is common,[4–6,13] but for

control of FBG, potential of these drugs appears limited. When a lichenoid type of inflammation is noted, as in case 1, corticosteroids may provide limited short-term relief of symptoms.[2]

The foreign bodies found in FBG tissue samples are usually consistent with dental materials, most frequently abrasives and often dental restorative materials.[3] Prevention would be the ideal solution to the problem, and restorative dentists should therefore exercise additional caution when finishing or polishing restorations close to the soft tissues. Patients with gingival ulcerations or recent oral soft-tissue trauma might be at particular risk for impregnation of foreign materials; therefore, unless a rubber dam can effectively isolate the procedure site, treatment should be delayed until the epithelium is clinically intact. Dental prophylaxis, particularly air abrasion polishing, has the potential to direct particles against the gingival tissues with significant force and speed. If the marginal tissues are highly inflamed, or any ulceration is noted, thorough scaling should be performed without these adjunctive polishing procedures. Patients should be informed that effective removal of supragingival and subgingival plaque and calculus is the most beneficial part of their periodontal maintenance, not the dental polishing at the end of their appointment.

Oral hygiene procedures must be modified for patients with frequent or chronic gingival ulcerations, to maximize effectiveness despite the tissue tenderness and to minimize the potential for impregnation of foreign substances in the tissues. Home care efforts must be minimally aggressive, to prevent further gingival abrasion and to minimize gingival recession. An ultrasoft manual toothbrush provides more tactile control than an electric brush for patients with fragile and tender gingiva. Given that foreign body reactions to toothpaste abrasives have been demonstrated experimentally,[15] brushing without a dentifrice is recommended if gingival erosions are present. A dentifrice with abrasive particles of high solubility, such as sodium bicarbonate, may be less likely to impregnate tissues. Various toothpaste ingredients cause oral ulcerations or gingival irritation, including toothpaste detergents[16,17] and tartar control formulas.[18,19] If a patient has suspected sensitivity to these agents, or if oral ulcerations are present, avoidance of products containing these chemical agents is recommended. Chemical antibacterial rinses may be necessary to assist with superficial plaque control when tissue soreness is severe, but products with high alcohol content should be avoided, to minimize chemical irritation and desiccation of the affected tissues.

Although FBG resembles other oral mucosal desquamative disorders, it has a distinct histologic profile. Careful and specific management is required to control symptoms and to limit periodontal tissue damage. ◆

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Osteonecrosis of the Maxilla in a Patient with a History of Bisphosphonate Therapy

• Maico D. Melo, DMD •
• George Obeid, DDS •

Abstract

Bisphosphonates, which inhibit osteoclasts, alleviate many of the devastating consequences of metastatic bone disease. However, bisphosphonates may play a role in the development of osteonecrosis of the jaws. We report our experience in the management of a patient with a history of bisphosphonate therapy who presented with osteonecrosis of the jaws following dental extraction to make others, particularly the broader dental community, aware of this potential complication. We also review the pharmacologic properties of bisphosphonates and their possible role in the pathophysiology of osteonecrosis. Until more is known about the role of bisphosphonates in the development of osteonecrosis of the jaws, we recommend that measures be taken to prevent osteonecrosis in those at risk, including, when feasible, a dental consultation before initiating bisphosphonate therapy.

MeSH Key Words: *case report; diphosphonates/adverse effects; osteonecrosis/chemically induced*

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Bisphosphonates are used widely in the management of bone diseases including osteoporosis, Paget's disease and hypercalcemia related to malignancy. Bisphosphonates inhibit osteoclasts, the cells responsible for bone demineralization. They have also been shown to inhibit tumour cell proliferation and inhibit angiogenesis.[1–7] These added features have made bisphosphonates useful in the management of bone metastases. Several clinical trials have shown that bisphosphonates reduce skeletal tumour burden in patients with multiple myeloma, breast cancer and prostate cancer,[8–10] leading to an increase in the use of bisphosphonates in the management of metastatic disease.

Recently, it has been reported that bisphosphonates are capable of causing osteonecrosis of the jaws.[11,12] Although this previously unrecognized complication is seen predominantly with the nitrogen-containing bisphosphonates, pamidronate and zoledronate, it has also been reported in patients taking non-nitrogen–containing bisphosphonates, alendronate and risedronate.[12] The former are indicated for the management of hypercalcemia of malignancy and are administered intravenously, whereas the latter are used in the management of osteoporosis and Paget's disease and are given orally. We were interested to learn of this complication, as we were recently involved in the management of a patient with a history of long-term bisphosphonate therapy presenting with osteonecrosis of the maxilla following routine dental extractions. We report on our experience in the management of this patient to make others aware of this potential complication.

Case Report

A 72-year-old woman was referred to us for treatment of a nonhealing extraction socket in the upper left maxilla following surgical extraction of her first molar 16 months earlier. Her past medical history included metastatic breast cancer, Parkinson's disease and hypertension. In addition to zoledronate, her medications included capecitabine, trastuzumab, levodopa and metoprolol.

Repeated attempts by the referring surgeon to close the extraction socket had been unsuccessful. At the time of presentation to our clinic, the woman had developed an oroantral communication and reported a foul-smelling discharge from the surgical site, but no pain for the past 3 months. On examination, we found bony exposure of the maxillary alveolus, and the surrounding soft tissues were erythematous and edematous (**Fig. 1**). In addition, the upper left premolars exhibited significant mobility.

Figure 1: *Pre-operative intraoral photograph showing exposed necrotic bone in upper left maxilla.*

Figure 2: *Axial computed tomography scan showing perforation of posterior wall and opacification of left maxillary sinus.*

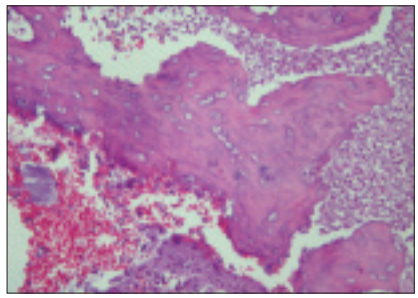

Figure 3: *Photomicrograph of surgical specimen showing necrotic bone with numerous inflammatory cells and clusters of filamentous bacteria [hematoxylin and eosin stain, original magnification ×100].*

Computed tomography revealed that the posterior wall of the left maxillary sinus was perforated and the sinus lining appeared thickened (**Fig. 2**). We were of the opinion that the oroantral communication had failed to heal due to the presence of underlying necrotic bone.

We decided to debride the site surgically. A mucoperiosteal flap was raised to allow access to the left maxilla; necrotic bone and overlying granulation tissue were removed and submitted for pathologic evaluation. The upper left first premolar was extracted, as it was retained within necrotic bone. Interestingly, the upper left second premolar had spontaneously exfoliated in the time between our initial consultation and the surgery. Following debridement of the necrotic bone and removal of granulation tissue, the surgical site was closed with resorbable sutures and allowed to heal by secondary intention. No attempt was made to close the oroantral communication.

The pathology report indicated that the surgical specimen exhibited osteonecrosis, with evidence of filamentous bacteria consistent with an actinomycotic osteomyelitis (**Fig. 3**). Whether this represents a true primary actinomycotic infection or superinfection of necrotic bone with *Actinomyces* is debatable. At postoperative visits over 6 months, the soft tissues surrounding the surgical site were no longer erythematous or edematous but the oroantral communication persists, albeit less conspicuously.

Discussion

Studies have shown that in addition to osteoclast inhibition, bisphosphonates, particularly the more potent nitrogen-containing bisphosphonates, also inhibit bone metastases and reduce skeletal tumour burden.[13] Although bisphosphonates vary in their potency, they share the ability to persist in bone for a prolonged period as they are not metabolized appreciably.[14] One study,[15] which examined the pharmacokinetic properties of bisphosphonates, reported that they persist for up to 12 years once they have been taken up in human bones. This may prove problematic in the management of complications related to bisphosphonates and implies that the potential for bisphosphonate-related osteonecrosis to develop may remain for several years even in those who have discontinued the drug.

Bisphosphonates have also been shown to inhibit proliferation in a variety of human tumour cells in vitro, including breast, myeloma, melanoma and prostate cell lines.[1–5] In an attempt to improve understanding of the antitumour properties of bisphosphonates, investigators have examined the effects of these drugs on intracellular signalling pathways and shown that they are capable of inducing apoptosis.[4] Inducing apoptosis would lead directly to a decrease in the number of tumour cells as well as nontumour cells as this is a ubiquitous cellular process.

Bisphosphonates also exhibit antiangiogenic properties.[6,7] This is believed to be important in reducing tumour burden by depriving tumour cells of adequate nutrient and blood supply. Overall, it appears that bisphosphonates alter the bone microenvironment making it less favourable for tumour cell colonization. Unfortunately, these changes also alter the normal homeostatic mechanisms of bone and presumably make it less favourable for normal bone cells.

Recently, bisphosphonates have been associated with increased risk for the development of osteonecrosis.[11] Although the precise role of bisphosphonates remains to be determined, the alteration in bone homeostasis coupled with odontogenic or surgical insult, or both, may be key to the development of osteonecrosis of the jaws.[11,12] This is supported by the observation that tooth extraction is a frequent precipitating event.[11,12] In our patient, tooth extraction was also the precipitating event in the development of osteonecrosis. However, lesions consistent with osteonecrosis have also been reported to occur spontaneously in the jaws.[12]

An earlier case report[16] identified etidronate, a bisphosphonate once used in the management of osteoporosis, as the cause of medication-induced dental implant failure. It described the failure of 5 successfully restored dental implants approximately 6 months after the patient began receiving etidronate. Although the authors correctly point

out that additional factors, including the development of a parafunctional habit, may have contributed to the implant failure, they recommended that dental implants not be placed in patients receiving bisphosphonate therapy and advised against bisphosphonate therapy in patients with existing dental implants. To our knowledge, no additional reports have addressed the effects of bisphosphonate therapy on dental implants in vivo. It has been suggested that bisphosphonates, with their antiresorptive properties, might one day be employed to facilitate implant osseointegration, but data to support this are lacking.[17] Thus, until more information is available regarding the role of bisphosphonates in the outcome of dental implants, it seems reasonable to adhere to the recommendations outlined above.

It is also interesting to note that certain similarities exist in the clinical presentation of bisphosphonate-related osteonecrosis and osteoradionecrosis. We speculate that there may be similarities in the underlying pathophysiology of these conditions. In osteoradionecrosis, radiation leads to homeostatic alteration of bone metabolism characterized by hypocellular, hypovascular and hypoxic changes that predispose the mandible to necrosis.[18] The necrotic bone is susceptible to and often secondarily infected in patients with osteoradionecrosis. In addition, the risk of developing lesions persists for the lifetime of the irradiated patient. We believe that in bisphosphonate-related osteonecrosis, bisphosphonates alter bone homeostasis sufficiently that the ability of bone to heal after minor insults is compromised. Under certain conditions the bone may also become secondarily infected and sequestrate, leading to a lesion that appears clinically similar to osteoradionecrosis.

Although much remains to be learned about the complex interactions by which bisphosphonates exert their effects, it seems prudent to make health care professionals and patients aware of the potential risk. Novartis, the manufacturer of Aredia (pamidronate) and Zometa (zolendronic acid), recently added osteonecrosis of the jaws to the precautions section of their product monographs. Novartis also recommends that patients receiving either pamidronate or zolendronic acid should avoid invasive dental surgery. It is not clear at this time whether discontinuing bisphosphonates would significantly alter the risk or course of osteonecrosis of the jaws.

We are currently collaborating with oncologist colleagues to identify strategies to improve the care of patients at our hospital. However, until more is known about the role of bisphosphonates in the development of osteonecrosis of the jaws, we recommend that measures be taken to prevent osteonecrosis in those at risk. This includes adopting appropriate preventive dentistry with control of dental caries and periodontal disease, avoiding dental implant placement and using soft liners on dentures. Similar to protocols in place at many institutions for preventing osteoradionecrosis in patients about to receive radiation treatment of the head and neck, we recommend that a thorough dental examination and necessary tooth extractions with time for healing be performed before commencing intravenous bisphosphonate therapy.

In addition, because dental surgery seems to be a precipitating event in the development of most cases of bisphosphonate-related osteonecrosis, it seems appropriate to recommend alternatives to tooth extraction for patients with a history of receiving either pamidronate or zolendronic acid. If alternatives to tooth extraction are not possible, the patient should be made aware of the potential risk of osteonecrosis and the surgeon should be prepared to assist the patient should it develop.

Unfortunately, there are insufficient data to guide unequivocally the management of patients who have developed bisphosphonate-related osteonecrosis. Until such a time, we recommend that efforts be focused on preventing the progression of lesions and limiting complications related to infection. To achieve this, background antibiotic coverage with penicillin-type antibiotics or a suitable alternative, such as doxycycline in penicillin-allergic patients, daily rinsing with 0.12% chlorhexidine mouthwash and conservative debridement of sequestrating bone should be considered. ◆

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The authors have no declared financial interests.

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To view the list of references, consult the electronic version of *JCDA* at http://www.cda-adc.ca/jcda/vol-71/issue-2/111.html.

Notice of Meeting

MEETING OF THE GENERAL ASSEMBLY

INCLUDING

THE ANNUAL GENERAL MEETING

Friday, April 15, 2005

TAKE NOTICE that a meeting of the Canadian Dental Association's General Assembly, including Annual General Meeting (AGM) and Interactive Session, will be held on Friday, April 15, 2005 at the Fairmont Château Laurier Hotel, 1 Rideau Street, Ottawa, Ontario, at 09.00 hrs.

George Weber
Executive Director & Secretary
Canadian Dental Association

STRATEGIC FORUM

Saturday, April 16, 2005

TAKE NOTICE that the Canadian Dental Association's Strategic Forum will be held on Saturday, April 16, 2005 at the Fairmont Château Laurier Hotel, 1 Rideau Street, Ottawa, Ontario, at 09.00 hrs.

George Weber
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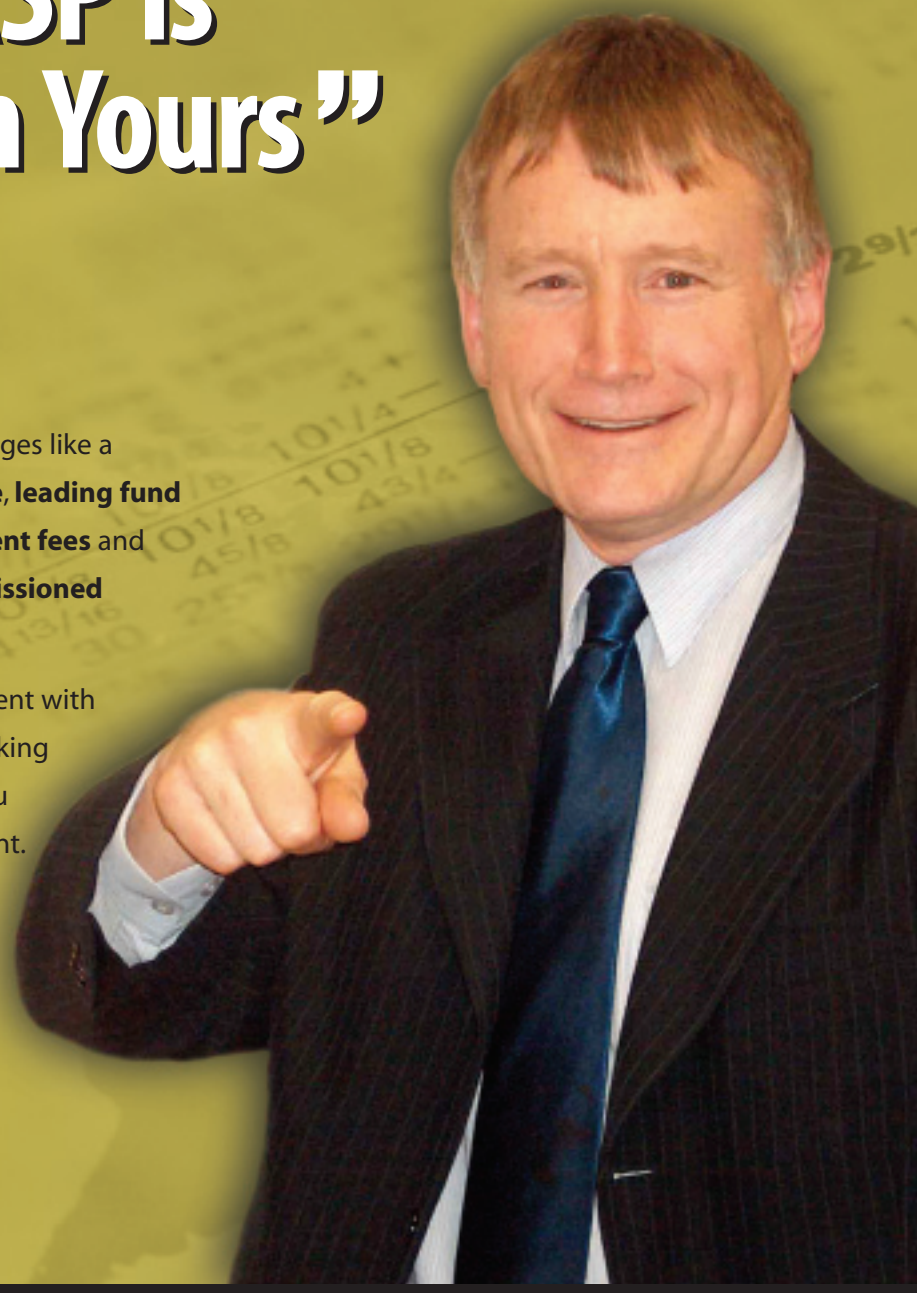

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SOURCE 2005 — the Academy of Laser Dentistry's 12th Annual Conference

Introducing a New Approach to Dental Laser Learning

For the first time ever, attendees at this year's Academy of Laser Dentistry's (ALD) 12th annual conference and exhibition, to be held April 6–9, 2005, in New Orleans, Louisiana, will be able to choose from a wide array of courses offered at the novice, intermediate and advanced levels. It is ALD's responsibility to offer a diversified and audience-specific program that will address the needs of all oral health professionals working with lasers, from dentists who are thinking of purchasing lasers to more experienced dental laser practitioners looking to stretch the envelope. This new approach reflects ALD's 12 years of commitment to the field of dental laser education and constant renewal of its educational methodologies and content.

The conference will take place at the award-winning New Orleans Marriott, located in the heart of the French Quarter, along the bank of the Mississippi River. The Marriott offers spectacular views of the city combined with atmosphere, cuisine, music and traditions unique to New Orleans.

Registration for ALD member dentists is $850 and non-members $1,300 US.

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— Janet H. Rice, DDS, ALD president.

Highlights of the Source 2005 General Sessions and Educational Program include:

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- **Focus on Success by Understanding Failures**
- **The Hygiene Forum**
- **The Exhibitors' Symposia**
- **Breakfast For Learning**

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Two pre-conference days (April 5 & 6) will be dedicated to certification (One-day Introductory Hands-On Course and Separate Two-day Program on Standard and Advanced Proficiency).

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For more information about the ALD and the conference, visit www.laserdentistry.org, www.source2005.org, e-mail memberservices@laserdentistry.org or estrella@laserdentistry.org, or call the ALD office at 1-877-LASERS6 (1-877-527-3776).

The Academy of Laser Dentistry is an ADA CERP Recognized Provider and an AGD Accepted National Sponsor (FAGD/MAGD Credit).

Point of Care

The Point of Care section answers everyday clinical questions by providing practical information that aims to be useful at the point of patient care. The responses reflect the opinions of the contributors and do not purport to set forth standards of care or clinical practice guidelines. This month's responses were provided by speakers at the Academy of Laser Dentistry's 12th Annual Conference and Exhibition, to be held April 6–9, 2005, in New Orleans, Louisiana.

Question 1

Is there a role for lasers in the treatment of peri-implantitis?

Background to the Problem

Peri-implantitis is a condition associated with progressive peri-implant bone loss. Bacteria may penetrate the peri-implant tissues, and if the infection is left untreated, advanced bone loss may lead to implant failure. Many treatment methods have been recommended for peri-implant bony lesions, but solid evidence for successful management is scant: only 2 clinical studies on the surgical treatment of peri-implant bony defects involving larger groups of patients have been published.

The early stages of mucositis as well as peri-implantitis can be treated with different antimicrobial agents (e.g., chlorhexidine digluconate, citric acid). In more advanced alveolar defects surgical treatment is also required. Adequate removal of bacteria from the implant surfaces is a prerequisite for new bone formation. Successful decontamination of implant surfaces by chemical or mechanical means (or both) enables some peri-implant bone regeneration to occur.

Evidence of the therapeutic effects of the local application of tetracycline fibres around failing implants is inconclusive. Systemic administration of antibiotics may not be desirable or effective because of pharmacologic limitations (i.e., bacteria resistance, ineffective dosage, etc.). The use of curettes and ultrasonic instruments for decontamination has been criticized because they cause damage to the implant surface. As for air-powder abrasive instruments, they should be used with extreme caution because patients face an increased risk of emphysema, especially when the instruments are used in the decontamination of deep alveolar bony defects. This treatment method may also damage the surface of hydroxyapatite-coated implants.

In recent years, lasers have been used to decontaminate implant surfaces. The essential points concerning the effectiveness and safety of different lasers used for this treatment are briefly outlined below.

Surface Decontamination Using Laser Applications

Soft and hard lasers can be used to decontaminate implant surfaces.

Soft lasers: Significant antimicrobial effects have been demonstrated when peri-implant pockets are irrigated with toluidine blue followed by irradiation with a diode soft laser (905 nm for one minute). The toluidine blue sensitizes the bacterial cell membrane to laser light.

Hard lasers: The application of the contact Nd:YAG (neodymium:yttrium aluminium garnet) laser leads to

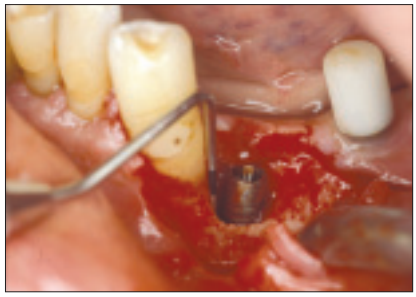

Figure 1: *Deep infrabony peri-implant defect.*

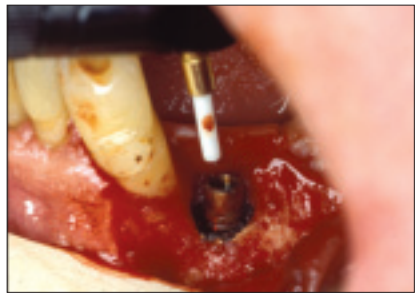

Figure 2: *Decontamination of the implant surface using the defocused beam of the CO_2 laser.*

Figure 3: *Augmentation of the lesion with bone grafting material Bio-Oss (Osteohealth Co., Shirley, NY).*

Figure 4: *Radiological examination 3 years after surgery shows complete new bone fill in the treated peri-implant lesion.*

adequate decontamination of the implant but may cause significant melting and crater-like formation of the implant surface. A significant temperature increase at the implant surface during Nd:YAG laser irradiation has been reported. Therefore, the application of the contact Nd:YAG laser for peri-implant surgery is contraindicated.

The CO_2 laser may be useful in the treatment of peri-implant lesions because of its bactericidal effect. With the CO_2 laser, there is no significant increase in the surface temperature of the implant or any alteration to the implant surface pattern (as viewed using scanning electron microscopy). Access flap surgery and final implant surface laser irradiation should be used for implant decontamination immediately before bone augmentation procedures (**Figs. 1–4**).

Diode lasers (980 nm) do not damage titanium surfaces even when they are used in high-power settings at the level of the hard lasers. They can be used for the removal of peri-implant gingival overgrowths and to decontaminate implant surfaces before bony augmentations. The advantage of this type of laser is that it comes in small, reliable delivery units. The use of diode lasers with 810 nm wavelength and at a high-power setting may damage the implant surface, and for this reason such a laser must be used with special care to successfully treat peri-implantitis.

A bactericidal effect has been observed with the erbium:YAG laser, but some authors have reported damage to the implant surface after irradiation. Some negative effects on implant surfaces have also been reported after frequency-doubled Alexandrite-laser irradiation.

In conclusion, lasers play a valuable role in implant surface decontamination, a necessary step in the treatment of peri-implantitis. Knowledge of laser–tissue interaction is important to prevent complications. ◆

Dr. George Romanos *is a full-time clinical professor in the department of implant dentistry, College of Dentistry, New York University, New York, and a Board member of the International Society for Lasers in Dentistry. E-mail: Dr.G.E.Romanos@t-online.de.*

Dr. Romanos will be presenting 2 sessions at the ALD conference: "Laser Oral Surgery for General Practitioners" (April 8) and "Lasers in Modern Implant Dentistry" (April 8).

The author has no declared financial interests in any company manufacturing the types of products mentioned in this article.

Further Reading

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Question 2

What are the advantages of laser soft-tissue surgery?

Background to the Problem

In addition to being a component of periodontal treatment regimens, soft-tissue surgery can also include separation of an overpowering labial frenum, excision of an irritation fibroma caused by an ill-fitting denture, uncovering of an impacted canine or management of herpes labialis. The most common soft-tissue procedure is the exposure of gingival margins during either placement of Class V fillings or preparation of crowns. The extent of the surgical site and the location of the target tissues may be different, but the clinical consequences remain the same. Before any incision of the well-vascularized soft tissues, the primary concern is always hemostasis. Moreover, the healing reactions of various soft-tissue wounds are complicated by the presence of countless microorganisms in a warm, moist medium, the saliva. For these reasons, hemostatic agents such as sutures and medications such as antibiotics and analgesics are commonly needed.

Solution

Compared with conventional blade surgery, laser soft-tissue surgery (LSTS) is more precise for the removal of target tissues, causing very little collateral damage to the surrounding nontarget tissues. The procedure leaves a well-defined, confined wound with all the related advantages: much better hemostasis during and after surgery and much less chance of postoperative pain, swelling and infection. Subsequent healing is usually uneventful, scarring is minimal to nonexistent, and there is usually little or no need for antibiotics or analgesic. Furthermore, the possibility of bacteremia is diminished because of the reduction in local bacteria and blood vessel coagulation.[1,2]

Figure 1a: *Short frenum before laser treatment.*

Figure 1b: *Separated frenum immediately following laser surgery.*

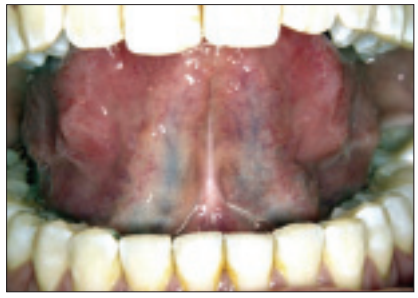

Figure 1c: *Photo at one-year recall. Follow-up care was uneventful.*

Figure 2a: *Lump of tissue inside cheek before laser treatment.*

Figure 2b: *View of inside cheek immediately after laser excision.*

Figure 2c: *At the 5-day recall, there is no bleeding, pain or swellling.*

The case of a 23-year-old woman with an underdeveloped lingual frenum (**Fig. 1a**) illustrates the precise nature of LSTS. Not only was the patient unable to chew properly, but the short frenum was directly interfering with her speech. The only reason for years of procrastination was her fear of the recommended hospital stay. A diode laser (SmilePro 980, Biolitec, Inc., East Longmeadow, Mass.) with an output of 980 nm infrared laser energy was used. Only the lingual frenum was separated; the surrounding tissues were left untouched. Complete hemostasis was achieved during and after the procedure, and no sutures were required. The patient was pleasantly surprised at the simplicity of the procedure and was amazed at the immediate result (**Fig. 1b**). Follow-up care was equally uneventful: there were no reports of bleeding, discomfort, swelling, scarring or relapse, and no medication was required (**Fig. 1c**).

In another case, a 53-year-old woman presented for removal of a nagging lump of tissue on her cheek (**Fig. 2a**). Because of the proximity of the lump to the oropharyngeal opening, postoperative swelling was a significant concern. Given the fibrous nature of this irritation fibroma, a DELight Er:YAG laser (Hoya ConBio Medical and Dental Lasers, Fremont, Calif.) with an output of 2940 nm was used. The nodule was removed with minimal to no bleeding (**Fig. 2b**). There were no reports of postoperative bleeding or pain, and, most important of all, there was no swelling (**Fig. 2c**). The specimen was sent for biopsy, and the diagnosis was confirmed. (Despite the clinical advantages, laser surgery is not encouraged where malignancy is suspected. The possibility of further spreading or stimulating the malignancy is presently not well understood.)

The more conservative laser treatment allowed both patients to be treated in a dental clinic instead of a hospital. The laser ablation and coagulation were limited to the epithelial and the immediate submucosal area by the use of water as the major coolant. The end result is a clean and precise surgical wound. The time required for the laser surgery and postoperative care was a fraction of the time that would have been required for conventional procedures, and both patients were able to resume their normal activities immediately, without any discomfort or bleeding. ◆

Dr. Frank Y. W. Yung *maintains a family practice in Toronto, Ontario. He is a member of the ALD and the American Society for Laser in Medicine & Surgery. He has achieved advanced proficiency in use of the diode (980 nm) and Er:YAG (2940 nm) laser wavelengths from the ALD. E-mail: FrankYung@sympatico.ca.*

The author has no declared financial interests in any company manufacturing the types of products mentioned in this article.

Dr. Yung's session at the ALD conference, titled "The Use of Water as Coolant in Er:YAG Laser Soft-Tissue Surgery," will be held on April 8.

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Question 3 What are the advantages of laser frenectomy in children?

Background to the Problem

Recently I suggested to a parent that her 3-year-old child would benefit from revision of the lingual frenum. The mother's first response was, "Why was this not suggested by my child's physician?" When I asked the mother if she had tried breast-feeding the infant, she replied that she had tried, but the child had not been able to nurse adequately and the mother had suffered quite a bit of discomfort. After a few weeks, she had reluctantly given up and had started the infant on bottle-feeding.

Among the pediatricians with whom I have discussed this scenario, many have felt that anatomic abnormalities of the frenum do not contribute to any significant problems and that revision of the tongue is unnecessary. Indeed, some have even suggested that the frenum stretches and the problem resolves itself.

Ankyloglossia or tongue-tie is an anatomic abnormality in which the insertion of the frenum, the tissue holding the tongue to the floor of the mouth, attaches so closely to the tip of the tongue that it restricts the tongue's functional movements (**Fig. 1**). Left untreated, it may contribute to a variety of problems in infants, such as inability to latch on to the mother's nipple. This may result in the infant being unable to gain weight or to sleep for periods of longer than 1 to 2 hours.[1,2] The child's ineffective sucking may cause soreness and mastitis in the mother, which may eventually force her to give up breast-feeding. In older infants, ankyloglossia can cause gagging and difficulty eating because the restriction of tongue movement means that the tongue is unable to clear food from the roof of the mouth.

If ankyloglossia is not treated in infancy (**Fig. 2**), the restriction of tongue movement in older children and adolescents may contribute to malocclusion, caries and speech disorders.

Recently, the American Academy of Pediatrics concluded that tongue-tie is a significant clinical entity and should be treated as early as possible to minimize breast-feeding problems.[3]

Treatment of the Problem in Infants

Initial examination of the frenum should be performed when the infant is only a few days old. After the birth, a physician or nurse lactation consultant should examine the tongue for mobility. A grooved tongue director (available through Miltex, York, Penn.) (**Fig. 3**) allows excellent viewing of the frenum area, without the examiner having to place his or her fingers into the oral cavity. If ankyloglossia is diagnosed, laser treatment can be performed to correct the frenum.

The following procedure[4–6] can be completed in a few minutes in the dental office. The infant is swaddled in a

Figure 1: *Newborn with complete ankyloglossia.*

Figure 2: *Untreated ankyloglossia in an infant.*

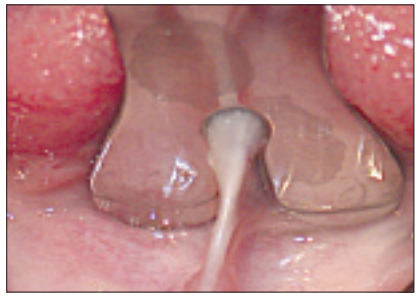

Figure 3: *Grooved tongue director.*

Figure 4: *The infant is swaddled in a blanket in preparation for the frenectomy.*

Figure 5: *Laser glasses protect the infant during the procedure.*

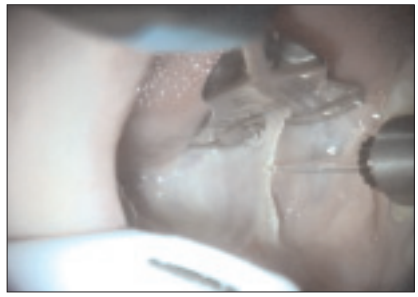

Figure 6: *Lasing of frenum (DELight Er:YAG laser, Hoya ConBio Medical and Dental Lasers, Fremont, Calif.).*

blanket to restrain movement and laser glasses are used to protect the infant's eyes (**Figs. 4** and **5**). The frenum is rubbed with topical gel (20% TAC; Universal Arts Pharmacy, Hialeah, Fla.) for 1 minute. The erbium laser is set to 30 Hz and 80 mJ, and the frenum is lased in a noncontact mode (**Fig. 6**). The procedure takes about 20 seconds to complete. The advantages of the laser include local rather than general anesthesia, no need for sutures (in most cases) and little or no bleeding. There appears to be little or no postoperative discomfort for the infant. Infants who have undergone the procedure are returned to the mother and are able to nurse immediately; typically, the mother reports disappearance of the discomfort associated with nursing.

Conclusions

Abnormal attachment of the lingual frenum is truly a quality-of-life issue. Revision of abnormal attachment of the lingual frenum in an infant is one of the most satisfying procedures a dentist can provide. Laser treatment is safe and is easily completed in the dental office. Not only does the frenectomy serve to treat the child's nursing problems, but it also has a positive impact on both the mother and the father. ◆

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Dr. Lawrence A. Kotlow *has received board certification as a specialist in pediatric dentistry from the American Board of Pediatric Dentistry and has achieved advanced proficiency in the use of the erbium laser through the ALD. He has had a private practice since 1974 in Albany, N.Y. E-mail: lkotlow@aol.com.*

Dr. Kotlow receives an honorarium for lectures from Hoya ConBio.

Dr. Kotlow will be making 3 presentations at the ALD conference: "Advanced Proficiency Certification: How to Effectively Create a Clinical Case Study Presentation Using Power Point" (April 5 & 9), "Infant Frenectomies: Revising the Maxillary and Lingual Frenum Using the Er:YAG Laser" (April 8) and "The Erbium Laser: the 'All Purpose' Laser" (April 7).

Question 4

How does the use of a laser improve cosmetic outcomes in restorative dentistry?

Background to the Problem

Dental lasers have become important tools for achieving optimal clinical and esthetic results in restorative dentistry. Dental lasers can be used in the surgical treatment of both hard tissue and soft tissue. The extent of the interaction of laser energy with tissue is generally determined by the specific wavelength of the laser emission and the optical characteristics of the target tissue.[1]

This article focuses on the carbon dioxide (CO_2) laser (10,600-nm wavelength), a soft-tissue laser. Laser light of this wavelength has a high affinity for water, and since human cells are composed chiefly of water, absorption of the CO_2 laser light by the tissues is very high. It is this absorption characteristic that makes the CO_2 laser suitable for precision cutting, ablation and coagulation of small blood vessels. The advantages of laser surgery include relatively bloodless procedures with excellent field visibility, enhancement of infection control and elimination of bacteremia, lack of mechanical tissue trauma, quicker healing, less postoperative pain and edema, less scarring and tissue shrinkage, microsurgical capabilities and prevention of tumour seeding.[2]

The indications for soft-tissue application of the CO_2 laser in cosmetic restorative dentistry include, but are not limited to, gingivectomy and gingivoplasty, frenectomy, vestibuloplasty, crown lengthening, removal of gingival pigmentation, removal of aphthae, exposure of second-stage implants and edentulous ridge surgery (including creation of an ovate pontic bed). In particular, use of a laser makes it easy to prepare and correct an edentulous ridge to accept an ovate pontic in cases where the available space is reduced and the distance from the alveolar crest to the ridge surface is greater than 3 mm.

Placement of an ovate pontic requires preparation of a concave gingival recipient site into which the pontic can be inserted.[3] The prepared recipient site should mimic the presence of the marginal and interdental papillae and the emergence profile of a natural tooth. The use of a laser in appropriate preparation of an edentulous ridge is described in the following section.

Figure 1: *Preoperative photo of unesthetic bridge.*

Figure 2: *The bone should be sounded to ascertain tissue thickness.*

Figure 3: *Immediate postoperative view of the ablated tissue.*

Figure 4: *Provisional bridge in place.*

Figure 5: *One month after treatment, the tissues have healed well.*

Figure 6: *Final bridge in place.*

Management of the Problem

The following sequence is appropriate for creating an ovate pontic form in an edentulous ridge with alveolar sufficiency (**Fig. 1**).

1. Complete a master diagnostic model establishing the proposed incisal dominance, width to length ratios, emergence profiles and occlusal scheme. From this model, create a polyvinyl putty impression to serve as a stent for provisional fabrication.
2. Provide local anesthesia and sound the bone with a periodontal probe to ascertain the thickness of tissue over the alveolar crest. It may be necessary to do this in both the coronal–apical and buccal–lingual directions. It is important to have at least 3 mm of tissue over the ridge before proceeding (**Fig. 2**).
3. Outline the surface of the ridge with an art pencil to mark the proposed shape of the emergence profile of the pontic from the tissue. Ablate the tissue with the CO_2 laser (approximately 4-W continuous beam), using a back-and-forth motion, as if applying paint with a paint brush, to achieve the desired depth and shape (triangular shape 1–2 mm deep) (**Fig. 3**).
4. Fabricate the provisional bridge, making sure that resin fills the newly created pontic bed. Finalize the provisional bridge, making certain that the tissue side is highly polished and is not exerting pressure on the tissue (**Fig. 4**).
5. Take a final impression and instruct the laboratory technician to follow the guidelines established in the provisional bridge. The tissue side of the final prosthesis must be made of highly glazed porcelain and should exert no pressure on the ridge.
6. Encourage the patient to maintain good oral hygiene and to rinse the area 4 times a day, for 3–4 days, with 0.12% chlorhexidine gluconate mouth rinse. Good oral hygiene will help the healing process (**Fig. 5**). The final effect is a pontic that has a natural emergence profile (**Fig. 6**). ◆

Dr. Duane H. Beers *is a charter member of the Academy of Laser Dentistry (ALD). He has worked with the CO2 and Nd:YAG lasers since 1992 and achieved advanced proficiency certification with the CO2 laser in 1998. He has maintained a private practice that focuses on cosmetic and reconstructive dentistry in Socorro, New Mexico, for 25 years. Dr. Beers is the recipient of the ALD's prestigious Leon Goldman Award. E-mail: drbeers@sdc.org.*

The author has no declared financial interests.

Dr. Beers' session at the ALD conference, titled "Cosmetic Emergence Profiles," will be presented on April 8.

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Clinical Showcase

The Diagnostic Wax-up: The Key to Success

Carol Waldman, DDS

Every successful journey should start with the goal in sight. In dentistry, when treating patients who require major cosmetic or functional changes, this means that knowing the final desired appearance and function of each patient's mouth is crucial to a successful outcome.

The diagnostic wax-up can be the single most useful tool in this type of work, not only for helping to determine how the patient's mouth should look and function, but also for communication with the patient and implementation of the treatment.

In my practice, all treatment planning begins with the acquisition of complete diagnostic records. I also carefully document the patient's "wish list" of treatment objectives. But of all the diagnostic information obtained from the patient, I believe that the mounted models and photographs are the most crucial for the work of the cosmetic dentist. It is the photos and models together that allow me to physically, in 3 dimensions, determine ideal tooth positioning and occlusal scheme, as well as the shape and size of the teeth in the restored smile. With the models properly mounted, I can dictate this information to the technician so that he or she can actualize these changes in wax directly onto a duplicate set of mounted diagnostic models.

Directions given to the technician may include any or all of the points listed below:

- position of incisal edge of maxillary central incisors (overbite and overjet)
- length of central incisors
- inclination of maxillary teeth to be restored
- amount (if any) by which the gingival line is to be raised (crown lengthening or "gum lift")
- relative lengths of lateral incisors, canines and bicuspids
- inclination of incisors
- occlusal scheme (canine guidance or group function)
- shape of teeth (oval, square, triangular, etc.)
- correction of occlusal plane (best demonstrated by facial photographs and a stick bite)
- amount by which vertical dimension is to be increased by opening the bite (if necessary).

At the consultation appointment, the completed, professionally mounted diagnostic wax-up is presented to the patient and sufficient time is allowed for him or her to examine the proposed changes. The patient is encouraged to comment on the proposed result and to state whether the wax-up accurately depicts how he or she would like the teeth to appear. Many patients comment that the teeth are too square, too round, too long or too short. If possible, adjustments to the wax-up are made on the spot, but if the requested changes are too numerous to carry out chairside, the patient is asked to return for another consultation appointment, at which time he or she can examine the wax-up models modified according to the requests. Allowing my patients this opportunity for input gives them confidence that their wishes are being followed and removes fear of loss of control and suspense over the final outcome. It is at this consultation appointment that patients will truly make the commitment to treatment if their concerns are heard and addressed. Patient involvement and approval at this stage is crucial in avoiding costly remakes.

The following is an example of use of the diagnostic wax-up in treatment of a patient wishing to not only improve the health of his mouth, but also show his teeth when speaking and smiling.

After carefully discussing the patient's goals and desires, as well as all diagnostic data, I sent instructions to my laboratory technician to fabricate a diagnostic wax-up for all maxillary teeth from the second bicuspids forward. (The molars were slated for extraction and replacement with implants.) **Figures 1** through **5** show the patient's pretreatment condition, and **Fig. 6** shows the diagnostic wax-up.

After the patient had been fully consulted with regard to treatment goals, costs and scheduling and had signed an informed consent agreement, the initial appointment for tooth preparation was scheduled.

During this tooth preparation appointment, the diagnostic wax-up again proved useful. My assistant fabricated a putty matrix over a model of the diagnostic wax-up, which was used as a stent from which the temporary restorations were created (**Fig. 7**). These temporary restorations were a duplicate of the "after models" that the patient had already approved. Indirect use of the wax-up for fabrication of the temporary restorations allowed the patient to experience directly the changes anticipated with the final restorations. As seen in **Fig. 8**, the patient was able to "test drive" his new teeth for esthetic and functional satisfaction.

At this point in the process, the patient should be directed to undergo a series of speech tests. Should the patient be uncomfortable with the pronunciation of any sounds, adjustments in the temporary restorations should be made accordingly. The adjusted temporary teeth will then be used for creating the final resotrations (**Fig. 9**).

One of the greatest advantages of this technique for the fabrication of diagnostic temporary restorations is the

Figure 1: *Lack of tooth display at rest and during normal speech.*

Figure 2: *Lack of upper lip support because of skeletal Class III condition.*

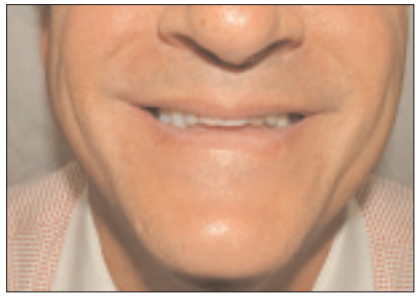

Figure 3: *Reverse smile line with the posterior teeth appearing lower in the occlusal plane than the anterior teeth.*

Figure 4: *End-to-end occlusion and dental trauma because of existing occlusal scheme.*

Figure 5: *Occlusal view showing heavy wear on anterior incisors and cantilever bridge replacing impacted tooth 23.*

Figure 6: *Diagnostic wax-up.*

Figure 7: *Putty matrix formed from the diagnostic wax-up and trimmed for fabrication of temporary restorations.*

Figure 8: *Improved smile line and tooth display after placement of the temporary restorations.*

Figure 9: *Smile with final restorations in place.).*

ability to make desired changes directly to the temporary restorations. For example, the temporary restorations can be shortened or lengthened incisally. I use a shade of flowable composite material that is compatible with the temporary acrylic, which is easily added and which readily adheres to the temporary restorations. Through a process of removal or addition of material, the clinician and the patient can together fine-tune the temporary restorations to represent the desired design for the final restorations.

Once the patient and I are satisfied with the appearance and function of the temporary restorations, my assistant makes a final alginate impression of the temporized teeth, which is sent to the laboratory as a guide for the final restorations. My technician then uses this "test driven" model as a guide for creating the final restorations.

Use of a diagnostic wax-up removes the guesswork from the fabrication of permanent restorations. Working out the ideal parameters of the final restorations while the temporary restorations are in place not only allays the patient's concerns regarding the final restorations but is crucial to the prevention of costly remakes that might be needed to address aspects of the structure that are unacceptable to the patient.

Today, patients rightfully expect the best in all aspects of treatment. The diagnostic wax-up facilitates that goal and maximizes predictability and patient satisfaction. ◆

Dr. Carol Waldman *maintains a private practice focusing on cosmetic and rehabilitative dentistry in Toronto, Ontario.*

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We wish to recruit bilingual dentists with the right attitude and skills. Candidates must be self-motivated, caring and gentle and interested in working in a transcultural setting.
Some travel required.

There are attractive communities with activities for the entire family. The great outdoors are at your convenience (fishing, canoeing, cross-country skiing, etc.).

With an emphasis on good quality, you will be able to practise all facets of dental medicine in rapidly developing facilities.

The remuneration is based on a generous fixed or hourly salary with fringe benefits (such as free accommodations, moving expenses, an isolation premium, up to 8 sorties a year and paid vacations) according to the Entente du Grand Nord established between the QDSA and the RAMQ (see RAMQ Dentist's Manual for details).

Preference is given to dentists with a minimum of 2 years experience or a Certificate from a Multidisciplinary Residency Program. Interest or experience in Pedodontics is an asset.

Applicants must provide two letters of reference, proof of responsibility insurance as well as detailed curriculum vitae (including S.I.N.). These have to be mailed, faxed or e-mailed to:

Cree Board of Health and Social Services of James Bay
ATTN: DR. EDUARDO KALAYDJIAN, DENTAL DEPT. HEAD
P.O. Box 250
Chisasibi (Quebec) J0M 1E0
Tel. (819) 855-9001, ext. 4221
Fax (819) 855-2867
E-mail ekalaydjian@ssss.gouv.qc.ca

D1660

'NAMGIS HEALTH CENTRE

'NAMGIS DENTAL CLINIC
(Alert Bay, British Columbia)
is seeking a
Dentist

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

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

For more information on the position, please contact:
Ian Knipe, Administrator
P.O. Box 290, Alert Bay, B.C. V0N 1A0
ph: (250) 974-5522, fax: (250) 974-2736 e-mail: IanK@namgis.bc.ca

D1598

NOVA SCOTIA - Halifax: Associate required for a busy family practice. Please fax resume to (902) 443-5614 or e-mail dentalstaff@hotmail.com. D1542

NOVA SCOTIA - South Shore: Join Dr. Kim Mailman (Dalhousie 1984) and his excellent team in the seaside town of Shelburne. Only 2 hours from Halifax, Shelburne has the most desirable microclimate in Nova Scotia, adjacent to one of the world's best natural harbours. This full-time associateship has future buy-in potential in an extremely busy office. Practise all aspects of dentistry and enjoy the relaxed lifestyle of the beautiful south shore of Nova Scotia. Tel. (902) 875-4441. D1534

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

ONTARIO - Lake Huron: We are looking for a full-time associate to join our practice. If you are interested in being fully scheduled, want to work with an experienced staff and think you might enjoy life in a beautiful resort town, we have the position you are looking for. Our modern office is fully equipped with 6 operatories, intraoral cameras and computers. We have recently replaced our charts, re-vamped our hygiene program and routinely attend continuing education courses. Buy-in option would be available for the right candidate. This would be an excellent investment opportunity for a new graduate. Please call Michael Walden at (519) 396-2641. D1654

ONTARIO - Ottawa east. Associateship full time. Very busy practice. Buy-in, cost sharing options available. French speaking an asset. Call Jocelyne, (613) 748-8266 D1668

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

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

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

QUEBEC - Abitibi: Rouyn-Noranda. Our family practice offers you a unique opportunity to join our team for a replacement during a maternity leave starting mid-April for a period of six months. Very busy practice, booked over two months in advance, full-time position guaranteed thereafter. Excellent work schedule; 4 days/week Monday to Thursday, no weekends. Very nice area, with lakes and forests nearby for the nature lover. For more information, please contact Aline at (819) 762-1972. D1659

QUEBEC - Montreal: Oral and maxillofacial surgery associate for well-established, solo, bilingual practice. Progression to buy-in and role reversal anticipated for the right individual who is skilled, personable and who considers patient care a priority. Confidential reply to: CDA Classified Box # 2845. D1669

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

SASKATCHEWAN - Regina: Full-time associateship available in a busy, established orthodontic practice. Excellent, oriented, energetic staff. Buy-in option. Please call (306) 586-3222 in confidence. D1665

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

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

VERMONT, US - Burlington: Beautiful Burlington, Vermont, is calling you! Established practice is seeking a dentist for a Monday through Friday work week. Full-time compensation includes: competitive salary, bonus potential and a

full benefits package (including a 401K plan with matching funds). Part-time candidates will be considered. Positions also available in other states. For a position with a future call Brian Whitley, (800) 313-3863, ext. 2290 or e-mail bwhitley@affordablecare.com. D1604

VERMONT, US: Dentists and oral surgeons. Opportunities for general dentists in Rutland, Montpelier and Lake Champlain areas. Openings available for employment, private practice and practice acquisitions. Enjoy the splendor of the Green Mountains and Lake Champlain, all part of the unbeatable Vermont lifestyle. Contact: Lynn Harris, tel. (800) 288-1730, fax (518) 266-9289, e-mail lynnharris@harrisbrand.com.

D1538

Equipment Sales and Service

CEREC 3D: $102,000 - no GST, no PST. Owner retiring. Compare with $152,000. Call (403) 282-0480. D1653

Letters

Continued from page 80

there is ample scientific evidence that I do need them. They are, in Dr. Schwartz's own words "necessary" services and "in the patient's best interests."

That scientific basis falls away for cosmetic interventions. It would be rather nonsensical for my dentist to insist, against my own objections, that I really need to look prettier and thus must have my teeth whitened. As I have argued elsewhere, ugliness is not a medical indication. Dr. Schwartz's own example appears to underscore my point. His patient physician is so "terribly self-conscious" about his discoloured central incisor that he "no longer smiles." In short, his physician has become a genuine patient, suffering from mental problems that can be objectively diagnosed according to the *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition). Indeed, if this patient were to counter that he is doing just fine, Dr. Schwartz would likely object that he may be overly self-conscious or even depressed, which can seriously impact his health. Dr. Schwartz could point to all kinds of scientific evidence to support his concerns.

Without objective — Dr. Schwartz uses the term "standardizable" — values, there could be no science of dentistry. All of the basic concepts of dental science (what is considered normal or abnormal, what constitutes illness or disease or a pathological or dysfunctional condition) entail value judgments. This is the very reason why dental students need instruction in dental ethics. And why society has granted dentists the status of professionals: because dentists continuously make important value judgments as to what, objectively, is in their patients' best interests.

Dr. Jos Welie
Professor
Creighton University Medical Center
Omaha, Nebraska

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CDA Fund Performance (for period ending December 31, 2004)

	MER	1 year	3 years	5 years	10 years
CDA CANADIAN GROWTH FUNDS					
Aggressive Equity fund (Altamira)	up to 1.00%	8.7%	14.0%	10.3%	9.9%
Common Stock fund (Altamira)	up to 0.99%	12.1%	4.0%	1.5%	7.4%
Canadian Equity fund (Trimark)†[1]	up to 1.65%	9.6%	6.2%	7.9%	9.1%
Special Equity fund (KBSH)†[2]	up to 1.45%	12.7%	4.7%	-4.3%	15.5%
TSX Composite Index fund (BGI)††	up to 0.67%	13.8%	7.6%	2.9%	9.4%
CDA INTERNATIONAL GROWTH FUNDS					
Emerging Markets fund (KBSH)	up to 1.45%	3.7%	7.9%	0.9%	n/a
European fund (KBSH)	up to 1.45%	-6.4%	-13.6%	-12.1%	n/a
International Equity fund (KBSH)	up to 1.45%	-3.7%	-7.7%	-12.7%	n/a
Pacific Basin fund (KBSH)	up to 1.45%	-2.2%	-2.9%	-22.4%	n/a
US Equity fund (KBSH)†[3]	up to 1.20%	-2.6%	-11.4%	-8.2%	9.1%
Global fund (Trimark)†[4]	up to 1.65%	5.0%	2.2%	5.7%	9.8%
Global Stock fund (Templeton)†[5]	up to 1.77%	8.1%	-0.9%	-1.1%	n/a
S&P 500 Index fund (BGI)††	up to 0.67%	1.8%	-6.3%	-6.5%	9.7%
CDA INCOME FUNDS					
Bond and Mortgage fund (Fiera)	up to 0.99%	4.9%	5.7%	6.5%	7.2%
Fixed Income fund (McLean Budden)†[6]	up to 0.97%	6.5%	6.2%	7.4%	8.5%
CDA CASH AND EQUIVALENT FUND					
Money Market fund (Fiera)	up to 0.67%	1.8%	2.0%	3.0%	3.8%
CDA GROWTH AND INCOME FUNDS					
Balanced fund (KBSH)	up to 1.00%	6.3%	1.7%	0.9%	7.5%
Balanced Value fund (McLean Budden)†[7]	up to 0.95%	8.7%	5.7%	6.5%	9.8%

CDA figures indicate annual compound rate of return. All fees have been deducted. As a result, performance results may differ from those published by the fund managers. CDA figures are historical rates based on past performance and are not necessarily indicative of future performance. The annual MERs (Management Expense Ratios) depend on the value of the assets in the given funds. MERs shown are maximum.

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

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

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

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