Dental TEAMWORK

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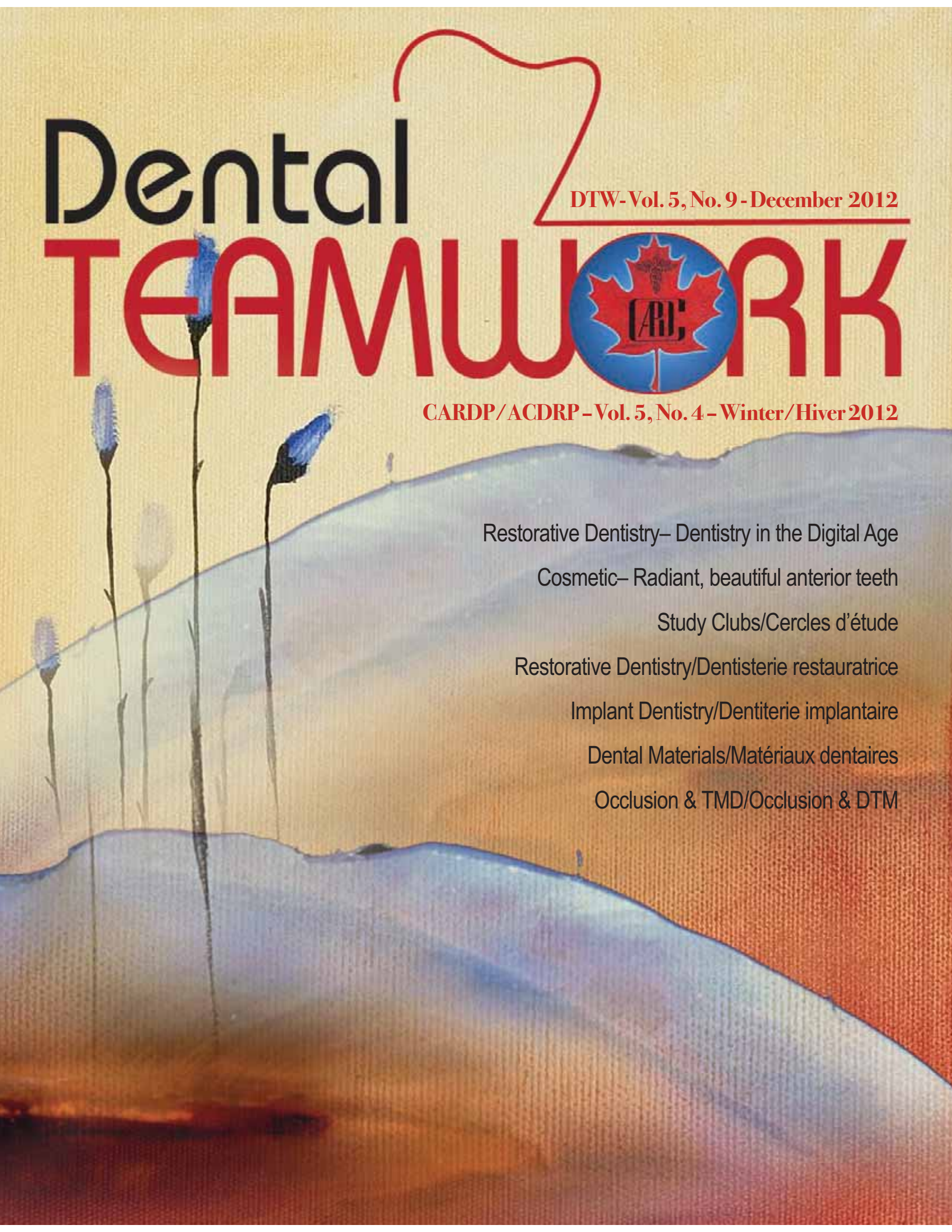
CARDP/ACDRP – Vol. 5, No. 4 – Winter/Hiver 2012



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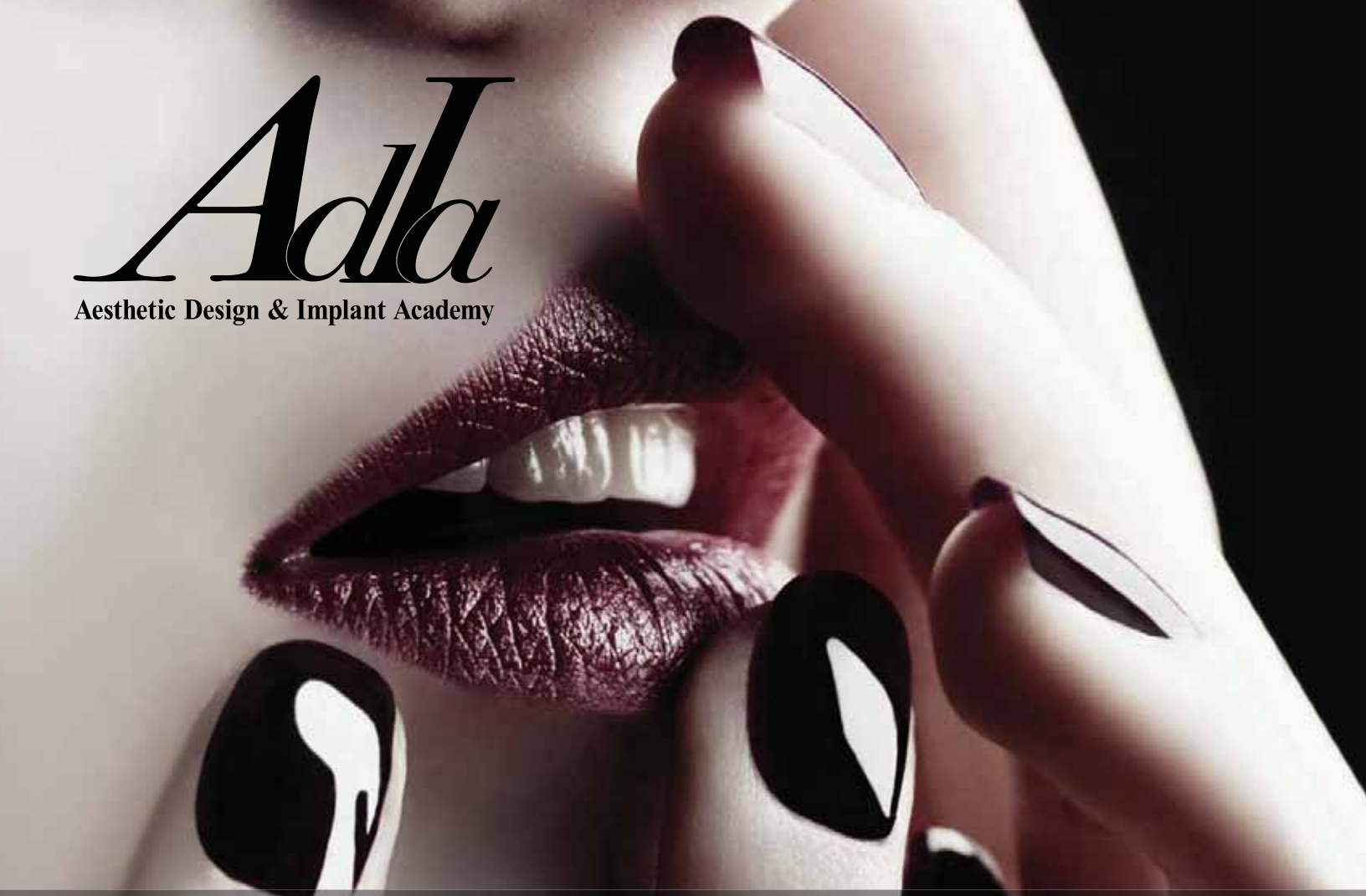

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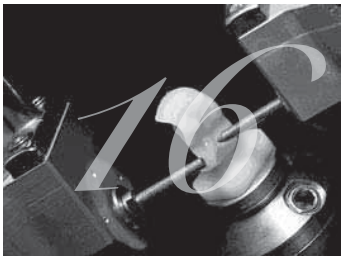

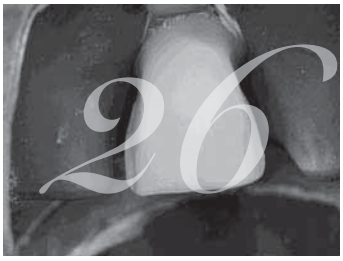

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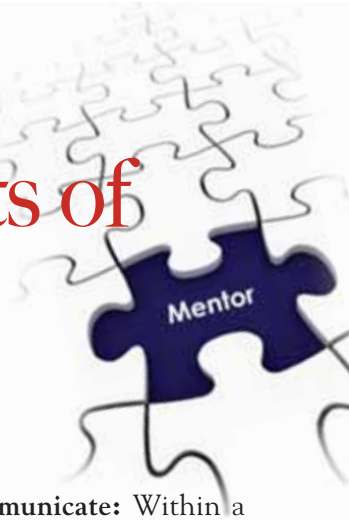

Dr. Hubert Gaucher

On a very festive, Annual Scientific Meeting closing Gala, this past September in Halifax, we, members and guests, had the pleasure of listening to our outgoing President, Dr. Maureen Andrea, pronounce her heartfelt farewell allocution. Dr. Andrea touched upon several themes of her presidency, the common thread of which were her acknowledgements of the numerous individuals who had mentored her throughout her life, in support of her drive for excellence. Dr. Andrea spoke for every one of us since we all appreciate that no one person makes it alone.

Mentoring has always been the bedrock of clinical dental education, since the inception of modern dentistry in North American faculties. Dental educators became quite adept at perpetuating the established one-on-one teaching method based on displaying clinical procedures then evaluating their pupils' resulting abilities. Even though, over time, pedagogical and technological supports keep evolving, the fundamentals of mentoring perdure.

For mentoring activities to succeed, a dental student will expect:

- **A credible teacher/clinician:** In other words, can that clinician perform? Can he/she do more than prattle? Can she/he actually finalize and demonstrate, for example, that subgingival distal chamfer on an upper second molar on a gagging patient? The mentor should "walk the walk". This entails that the didactic content must derive from the mentor's own clinical expertise.
- **A teacher who can communicate:** Within a clinical setting, and given time constraints, patient particularities, and the varying levels of knowledge of each student, the enterprise of creating a mutually satisfactory teacher/pupil dialogue becomes an artform. A clinical mentor is task oriented and provides guidance. The mentor must grasp a student's learning needs, by quickly extracting and evaluating the concepts that the student masters or lacks, then rapidly assess the clinical aptitudes displayed by the student and almost instantaneously formulate a sequence of clinical events that will guarantee that the student has mastered the operation.

The mentor's intervention is all the more appreciated when it is transmitted with tact and respect for both the patient as well as the student.

Perspectives of Mentorship:

Many predict that mentoring will keep increasing in Dentistry based on factors such as:

- **Study Clubs:** Their numbers are on the rise, spearheaded by dental specialists and generalists alike, who wish to upgrade the knowledge base of practitioners. What with the appearance of up-to-date technologies and instrumentations, a learning curve is required and a study club environment can fulfill the need for individualized transmission of knowledge and clinical proficiency.
- **Dental Curricula:** Faced with tighter budgets within universities, where operational and

administrative reductions are being imposed, dental faculties are forced to limit the number of their full time professors and/or student ratios while hiring part time faculty members with, in many cases, fewer academic credentials. In addition to this financial amputation, and its subsequent dilution of desirable (i.e. specialized) teaching personnel, consider the increasing number of new subjects that a contemporary curriculum requires, and it becomes evident why young graduates are left wanting in many clinical areas.

I recently interacted with a fourth year dental student from Ontario in such a mentor/pupil situation. He informed me that, due to restricted resources at his faculty, a person could graduate and be qualified for a license to practice without having executed a conventional bridge. This student had zero notions of low and high soldering techniques or their indications, and none regarding the use of conventional transfer copings. My jaw dropped. Having taught and defended fixed prosthodontics curricula for over three decades, I now have to accept that graduates will no longer be performing time proven clinical procedures for the benefit of their patients?

- **Professional apprenticeship:** Owing to the dire need to augment the clinical knowledge base and expertise of our graduates, we could learn from the example of other professions who propone apprenticeships or residencies. Lawyers, architects, pharmacists and accountants, among other occupations, are required to undergo a post-graduate apprenticeship and, in most cases, must submit to professional proficiency examinations, independent of universities. For instance, a one-year residency in Medicine is required post-university. In taking a similar initiative, Dentistry would obviously create a further need for mentoring since, ultimately, a clinical teaching setting would be required.

Since mentoring activities are inevitable, how can the dental profession sanction quality assurance measures and qualified mentors?

In view of the fact that dental faculties are already over-burdened, and since patient needs compel practitioners to expand their clinical skills, the various provincial Orders or Colleges might take on this regional responsibility. A case in point is the B.C. College of Dental Surgeons which offers a mentorship program to its members. Accreditation of registered study clubs and the monitoring of the quality of the dispensed CE courses fall under the jurisdiction of this Provincial Professional Regulatory Body.[1] Another initiative of collaboration between the B.C. College of Dental Surgeons and the B.C. Dental Association is the Sirona Training Centre[2], operated by the Association in the College's building.

If ever the dental profession decided to establish required professional residencies for its graduates, a much broader network of mentors and clinical facilities would be called for. Certified mentors in dental practices would have to be recruited, residency programs defined and end results evaluated.

Funding for these province-wide mentorship programs would come from the dental profession itself, whose obligation to patients is to remain transparent at all times. To that end, one option might be to levy a tax deductible percentage of each practionner's income as seed funding for such residencies.

It is my opinion that the appropriate sources for obtaining, maintaining and advancing the clinical skill levels of practitioners ought to come from the provincial dental regulatory bodies themselves. If they don't step up to the plate, who will?

As we prepare for the coming Holiday Season, your Editorial Board members join me in wishing you a peaceful and joyful time with family and friends!

Dr. Hubert Gaucher
hgaucher@sympatico.ca
Editor-in-Chief

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- College of Dental Surgeons of British Columbia http://www.cdsbc.org/%7EASSETS/DOCUMENT/Study-Club-Application-and-Criteria1.pdf
- Sirona Training Center, Vancouver, BC http://www.bcdental.org/CE_for_Dental_Professionals/Default2.aspx?id=6383

Les complexités et bénéfices du mentorat

Dr. Hubert Gaucher

À l'occasion du dîner de clôture de notre congrès à Halifax en septembre dernier, nous, membres et invités de l'ACDRP, avons eu le plaisir d'entendre l'allocution de notre présidente sortante, Dr Maureen Andrea, dont le fil conducteur portait sur les nombreux individus qui lui avaient servi de mentors sa vie durant, dans sa quête de l'excellence. Puisque nul ne peut réussir seul dans la vie, Dr Andrea exprimait en effet les sentiments de tous les auditeurs dans la salle.

C'est justement ce genre de mentorat qui est l'assise de l'éducation dentaire clinique depuis ses tout débuts dans les facultés dentaires nord américaines. Leurs éducateurs réussirent à perpétuer la méthode «un à un» en faisant les démonstrations de techniques cliniques suivies de l'évaluation des habiletés à les reproduire de leurs élèves.

Malgré toutes les avances technologiques et pédagogiques depuis, les fondements du mentorat perdurent.

Pour que le mentorat réussisse, l'étudiant en dentisterie s'attend à:

- **Un clinicien/enseignant crédible:** En d'autres mots, le clinicien est-il apte à reproduire ce qu'il avance? Par exemple, peut-il exécuter la préparation d'un chanfrein sous-gingival distal d'une deuxième molaire supérieure en présence d'un patient qui souffre d'un haut-le-coeur? Un mentor doit réaliser ce qu'il préconise, ce qui implique que son contenu didactique soit fondé sur sa propre expertise.
- **Un clinicien qui peut communiquer:** Dans un contexte clinique particulier, étant donné les contraintes dans le temps, la spécificité de chaque patient ainsi que les différents niveaux de connaissances des étudiants, la tâche d'élaborer un dialogue maître/élève qui sera mutuellement bienfaiteur devient un art. L'objectif premier du mentor en clinique est de guider. À cette fin, il doit saisir les besoins d'apprentissage de son élève en soutirant et évaluant les concepts maîtrisés ou non de ce dernier, pour ensuite établir ses aptitudes cliniques et presqu'immédiatement formuler une séquence d'opérations cliniques aptes à assurer l'habileté souhaitée.

  L'intervention du mentor est d'autant plus appréciée si elle a lieu dans le respect et le doigté vis-à-vis du patient aussi bien que l'apprenant.

Perspectives du mentorat:

Basés sur certains faits, plusieurs prédisent que le mentorat ne fera qu'accroître en dentisterie.

- **Cercles d'étude:** Leurs nombres croissants, pilotés par des omnipraticiens et spécialistes, ont comme but de maintenir à jour leurs connaissances des dernières technologies et instrumentations dans un cadre de transmission de compétences individualisée.
- **Curricula dentaires:** Face à des budgets d'opérations et administratifs de plus en plus restreints, les facultés dentaires se voient dans l'obligation de réduire leurs effectifs à temps

plein et d'augmenter leur ratio d'étudiants tout en embauchant un personnel enseignant qui se veut souvent moins diplômé. En plus de cette amputation financière, accompagnée de la dilution des spécialistes, tenons compte du curriculum dentaire contemporain qui multiplie les nouvelles matières et qui font en sorte que la formation clinique de nos jeunes diplômés laisse à désirer.

- **Dernièrement**, j'ai vécu une situation mentor/élève avec un étudiant ontarien finissant. Il m'a appris que, dû aux ressources limitées de sa Faculté, on pouvait être promu et autorisé de pratiquer sans pour autant avoir placé un seul pont conventionnel en bouche. Il ne possédait aucune notion des techniques de soudure à basse et haute fusion, ni de leur utilisation ou de couronnes transferts conventionnelles. Je suis resté stupéfait. Après avoir enseigné et défendu les curricula de prosthodontie fixe pendant plus de trois décennies, suis-je maintenant tenu d'accepter que nos diplômés ne pratiqueront plus les procédures privilégiées qui ont fait leurs preuves pendant si longtemps?

- **Stages:** L'impératif d'ajouter aux connaissances et aptitudes de nos jeunes dentistes exigerait une mesure qui s'apparente à plusieurs autres occupations, à savoir, le stage professionnel. Avocats, architectes, pharmaciens, comptables, etc., sont tous tenus de faire un apprentissage post-scolaire et doivent, dans plusieurs des cas, subir des examens de compétence qui sont indépendants des universités. La résidence en médecine en est un autre exemple. Une telle initiative en dentisterie engendrerait le besoin pour un nombre plus considérable de mentors puisque, ultimement, la formation post universitaire aurait lieu en milieu clinique.

Si de telles activités de mentorat sont inévitables, comment notre profession assurera-t-elle la qualité de cet exercice?

Puisque les facultés dentaires sont déjà excédées et que les patients imposent à la profession des mises à jour cliniques constantes, il en tiendra aux divers Ordres ou Collèges dentaires provinciaux d'en assumer la responsabilité. On en trouve un modèle au B.C. College of Dental Surgeons qui offre justement un programme de mentorat à ses membres. L'accréditation de cercles d'étude inscrits ainsi que la surveillance de la qualité des cours EC dispensés, sont soumis à la juridiction de ce corps provincial régulateur[1]. Un autre effort de collaboration a lieu avec le B.C. College of Dental Surgeons et le B.C. Dental Association d'une part, et Sirona Training Centre[2], qui opère à même l'édifice du Collège.

Si jamais la profession dentaire imposait un stage à ses finissants, un réseau beaucoup plus étendu de mentors et de ressources cliniques sera requis. Des mentors certifiés venant de la pratique privée seraient recrutés, les programmes de stages mis sur pied, et les résultats du projet, analysés.

Les fonds pour un tel programme de stages à l'échelle provinciale viendraient de la profession elle-même, qui doit à la population une rigoureuse transparence. Une option de financement pourrait venir d'un pourcentage déductible d'impôt sur le revenu de chaque praticien.

Je crois que les ressources pour instituer, maintenir et avancer les aptitudes cliniques des praticiens dentaires relèvent de leurs organismes régulateurs provinciaux. Si eux n'y voient pas, qui d'autres?

Le temps des Fêtes approche et tous les membres du comité de rédaction se joignent à moi pour vous souhaiter de joyeux et doux moments avec parents et amis.

Dr. Hubert Gaucher
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- College of Dental Surgeons of British Columbia http://www.cdsbc.org/%7EASSETS/DOCUMENT/Study-Club-Application-and-Criteria1.pdf
- Sirona Training Center, Vancouver, BC http://www.bcdental.org/CE_for_Dental_Professionals/Default2.aspx?id=6383

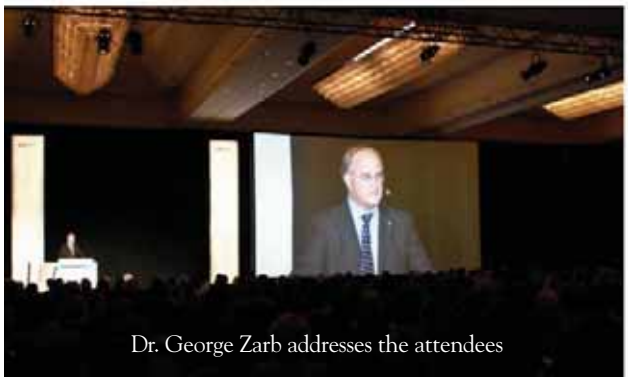
Three decades of patient mediated outcomes and concerns with Osseointegration

On October 19th and 20th, 2012, Nobel Biocare Canada Inc. held a 30th Anniversary Scientific symposium at the Sheraton Centre Toronto with a capacity crowd 600+ clinicians in attendance.

"Per-Ingvar Brånemark's seminal osseointegration research led to its global launch in May 1982 at the Toronto Conference on Tissue Integrated Prostheses.

The resultant worldwide trajectory of its clinical application ensured exciting and continuing synergies between clinical disciplines and the world of biomaterials; and the ensuing years have also seen numerous clinical scientists coloring in novel additional details to the technique with a resultant and exciting expansion of its versatility and application. Ongoing research continues to nurture and expand clinical applications of osseointegration and this 30th Anniversary Symposium offers presentations from some of the best minds in clinical dentistry. Our invited lecturers from the international community of dental scholars will synthesize current information on what is best and safest in providing treatment with dental implants; and in the necessary context of patient-mediated concerns regarding optimal outcomes."

Dr. George Zarb



Dr. George Zarb addresses the attendees

With that statement from the Scientific Co-Chair, Dr. Zarb began two intense days of learning that included main session lectures and parallel sessions with panel discussions. A broad view of our past, present and potential future treatment were presented by 30 speakers with varying topics from reconciling protocols to advanced reconstructive procedures to improve the patient's quality of life.

The conference opened with a welcome address from Mr. Kishore Pranjivan, Country Manager for Nobel Biocare Canada. Dr. George Zarb welcomed the delegates to the opening session of the Nobel Biocare Symposium and Nobel Biocare CEO Mr. Richard Laube, provided an explanation of "Designing for Life", the simple slogan encompassing Nobel Biocare's commitment to the patient's quality of life and to set a higher standard of care that Nobel Biocare aspires to achieve.

Prof. Ulf Lekholm discussed the 60-year perspective of the osseointegration story and provided an interview with Professor Per-Ingvar Branemark.

Dr. Bertil Friberg, Dr. Lyndon Cooper, Dr. Georg Watzek and Dr. Xinquan Jiang continued in the morning session. The afternoon lectures were presented by Dr. Sreenivas Koka, Dr. Michael MacEntee, Dr. Oded Bahat and Dr. Urs Belser.

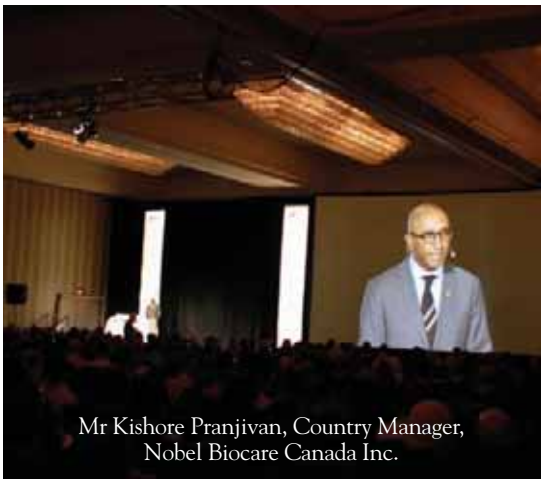
Day One ended with a celebration gala event at Muzik Night Club.

Day two provided four parallel sessions in the morning these included, addressing soft tissue and aesthetics, the edentulous predicament, integrating digital solutions and practice growth. Speakers included, Dr. Ulf Lekholm, Dr. Edmond Bedrossian, Dr. Lesley David, Dr. Kenneth Parrish, Dr. Steven Bongard, Dr. Peter Moy, Dr. George Zarb, Dr. Peter Wöhrle, Dr. Joseph Kan, Dr. Eric Van Dooren, Dr. Sascha Jovanovic, Dr. Robert Carmichael, Dr. John Zarb, Mr. Trevor Laingchild, Mr. Thomas Wade, Mr. Joseph Coursey, Dr. George Duello and Mr. Forrest Cottrell.

From Left to right:
Dr. Oded Bahat, Dr. Peter Moy, Dr. Lesley David

Prof. Ulf Lekholm

From right to left:
Prof. Ulf Lekholm, Dr. Bertil Friberg and
Mr. Richard Laube, Nobel Biocare CEO



Mr Kishore Pranjivan, Country Manager,
Nobel Biocare Canada Inc.

The meeting concluded with a main session on Saturday afternoon with Dr. Peter Schüpbach sharing histological images of osseointergation. This was followed by three unique clinical examples of how osseointegration has had a profound impact on patients' lives from Dr. Peter Wörhle, Dr. Edmond Bedrossian and Dr. Johan Wolfaardt.

Dr. Zarb ended the meeting stating "We are ending on a note that shows you that the journey of hope has become a successful one….meetings such as this are a strong endorsement of the conviction that knowledge continues to gain momentum as the currency of success".

Kevin McAuley
Director, Marketing/ Training and Education
Nobel Biocare Canada Inc
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Osstem Implant

Osstem Implant is pleased to announce the launch of its first Canadian subsidiary Hiossen Implant Canada with Mr. Shawn Kim as the President. Mr. Kim has nine years experience in the financial industry where he started as a business analyst. After dedicating 3 years to Mackenzie Financial Corporation in Toronto, he moved to AIG in Korea where he successfully implemented a worldwide marketing model and secured new business alliances. In April 2011, he joined Osstem Implant to represent the company in Canada. Osstem is the number one implant company in Asia, and the fastest growing implant company currently ranked as 6th largest dental implant company in the world. Mr. Kim graduated from the University of Western Ontario in 1996 with a BA in Administrative and Commercial Studies, and subsequently obtained Certified Public Accountant license from USA in 2000.

Hiossen Implant Canada Inc.

Hiossen Implant Canada Inc. is pleased to introduce Dinesh Shettigar as its Product Specialist for Ontario. Dinesh has more than 15 years of experience in the dental profession. He practiced as a General Dentist for 8 years in India. Before joining Hiossen Canada, he was working for a full service dental lab in Toronto leading the Continuing Education program, Dental Photography & Imaging and importantly, communicating with dentists to ensure the success of their cases. Dinesh is thoroughly enjoying his career in the dental implant industry. Besides the opportunity to meet new people, he gets really excited when he is chairside, assisting dentists with their implant and sinus lift surgeries. His previous experiences as a dentist and in the lab go a long way in ensuring that he is an asset to the dentists for their cases.

If you have any questions about the Hiossen Implant system or innovative sinus surgery systems, please feel free to contact him on 647.890.4045 or dinesh.hiossen@gmail.com

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"Feature Your Foto" **Reminder!**

This is a reminder that the best photo(s) for the photo contest about DOGS will be published in the January 2013 issue of Dental TeamWork. Remember that the judges' decisions are final.

As a reminder please note that in 2013 the photo contest will be published in every other issue of Dental TeamWork to give participants more time for submitting their final shots. For this competition only one (1) photo file per entry is needed. Anyone may enter, even if he/she is a member of another profession and/or specialty.

Come on and submit your best shot! Tell us what camera you used and some details about the picture. For each subject please submit one (1) Digital JPEG File, approximately 250-300k (no larger). Send everything to me @ larrygaum@rogers.com.

All the best and good luck.
Larry Gaum

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1:00pm - 5:00pm - Surgical Protocol - Surgical Technique - Surgical Components and Armamentarium - Post Operative protocols - Case Review	**1:00pm - 5:00pm** - Post Op Instructions, Patient Protocol, Healing Period, Evaluations, Follow Ups - Final Impressions - Final Prosthesis – Materials, Occlusion - Follow Ups, Recalls	**PM** - Surgical Review LAB : Surgical Phase - Impressions and Retrofit Review LAB : Retrofit Phase - Final Prosthesis Review

*** another day will be added to schedule if needed**

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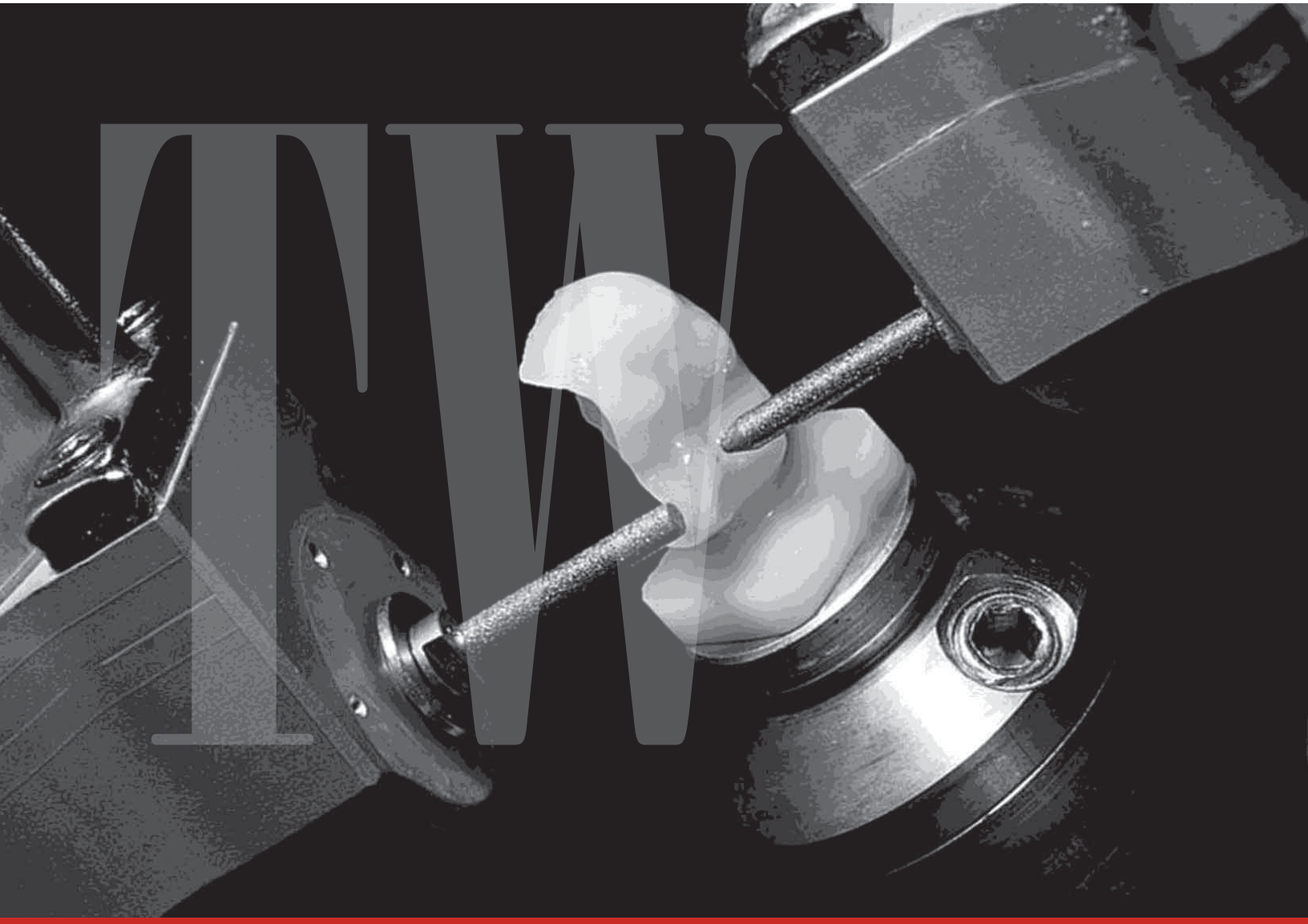

Restorative Dentistry

Dentistry in the Digital Age: An Update

Author:

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Introduction

Without many in the profession taking notice, restorative dentistry is currently undergoing its most significant revolution since the introduction of adhesive dentistry; this is the digital revolution and it is the beginning of the end for physical impression materials. Though digital impressions (starting with CEREC 1 [Sirona]) have been in the market for over 25 years, it is only in the last 5 years that we have seen the development of significant competition. And with this, has come a dramatic uptick in innovation and development for digital impression units and CAD/CAM devices.

Some clinicians may be quite happy with their current impression materials and see little reason to consider changing to digital impressions. And fortunately for them, the physical impression materials will continue to be available for quite some time. Like much of dentistry though, we (and our patients) have simply adapted to the annoyance and frustration that come with physical impression materials. Patients don't often complain about impressions and having to wear a provisional restoration because many do not know there is an alternative. Clinicians have come to expect that a cementation appointment requires 30 minutes or more and that the prosthesis will often require adjustments. It is also difficult for us to consider switching away from an impression technique that we have worked so hard on perfecting. Those that do make the decision to switch from physical to digital impressions and CAD/CAM will inevitably have a learning curve to address, but there are significant benefits to gain in getting through it, particularly in terms of patient recruitment and retention.

As of this writing, there are currently 4 digital impression devices available in the United States market (Table 1)(Figure 1). There are 3 more units that were available for purchase in the first or second quarter of 2012. Digital impression devices are best understood as a 2-component system. One component is the digital impression unit (Figure 1); the other component is the CAD/CAM chamber (Figures 2 and 3). Currently, only 2 systems (E4D (D4D Technologies) and CEREC [Sirona]) are available with an in-office milling chamber. The digital impression unit is placed chairside in the operatory and is used by the dentist or the chairside dental assistant to digitally scan the preparation (a digital "impression"). The CAD/CAM Chamber is generally located in the office laboratory and is then used to mill the restoration. The systems are available in 2 configurations: as a stand-alone digital impression unit, or as a complete in-office

Table 1

	LAVA C.O.S.	iTero	Cerec AC Bluecam	E4D
Imaging Technology	LED / 3D Video	Laser / Optical Confocal	LED	Laser
Intraoral Scanning	X	X	X	X
Impression Scanning			X	X
Powder-Free Scanning		X		X
Lab Fabricated Restorations	X	X	(via Cerec Connect)	(via E4D Sky)
In-Office Milling			X	X
User Interface	Touchscreen	Mouse, Keyboard, Foot pedal	Trackball, Keyboard	Mouse, Keyboard
Available Restorative Materials	Acrylic Composite Feldspathic Porcelain Leucite Reinforced Porcelain Lithium Disilicate Porcelain Zirconia (In-Lab mill only) Gold PFM	Acrylic Composite Feldspathic Porcelain Leucite Reinforced Porcelain Lithium Disilicate Porcelain Zirconia (In-Lab mill only) Gold PFM	Acrylic Composite Feldspathic Porcelain Leucite Reinforced Porcelain Lithium Disilicate Porcelain Zirconia (In-Lab mill only)	Acrylic Composite Leucite Reinforced Porcelain Lithium Disilicate Porcelain
Unique Features	Touchscreen Interface Reduction Guide 3D prep review Video Capture	100% powder-free scanning Reduction Guide Invisalign integration Battery back-up	Fast Scanning Process Simultaneous Multi-tooth Design Upgradeable to In-office Milling Battery back-up	Dentrix Integration Simultaneous Multi-tooth Design Smallest wand head E4D Compass (CBCT)

Fig. 1

Fig. 2

Fig. 1: There are currently 4 digital impression/CAD/CAM units available in the United States: (from left to right) LAVA C.O.S (3M ESPE), iTero (Cadent), E4D (D4D Technologies), and CEREC AC Bluecam (Sirona).

Fig. 2: The CEREC system is available with or without one of 2 CAD/CAM milling chambers; shown here is the MCXL unit.

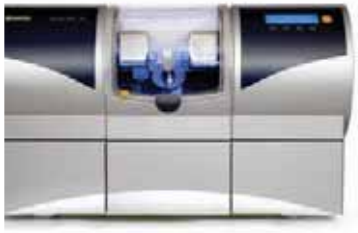

Fig. 3:
The E4D has one optional CAD/CAM milling chamber.

Table 2

	Digital Impression Units (Stand Alone Configuration)	In-Office CAD/CAM System (Digital Impression Unit + In-Office Mill)
Systems Available	iTero	Cerec Bluecam AC
	LAVA COS	E4D
	Cerec AC Connect	
	E4D Sky	
	IOS Fastscan (coming soon)	
	Hint ELS (coming soon)	
	3Shape Trios (coming soon)	
Advantages	Extremely positive patient perception	High potential R.O.I (reduced lab bill)
	Lower initial investment	Complete restorative control
	Allows all types of restorations	Same-day Dentistry possible
	Well suited to larger / complex cases	Extremely positive patient perception
	No inventory to maintain	No impression materials needed
	No impression materials needed	
Disadvantages	Same-day dentistry is not possible	Higher initial investment
	Does not reduce lab bill	Requires management of significant inventory
	Per use fees, model fees	Requires significant training
		Limited to porcelain, composite and acrylic restorations
Approximate Upfront Cost	$20-30,000	$120-130,000

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CAD/CAM system that includes the digital impression unit and the CAD/CAM Chamber (Table 2).

Currently Available Digital Impression Units (Stand-alone configuration)

- V- LAVA C.O.S. (3M ESPE)
- iTero (Cadent)
- CEREC AC Connect
- E4D Sky

Digital impression units function as a digital replacement for physical impression materials (ie, vinyl polysiloxane [VPS]). The operator prepares the teeth to be treated (Figures 4 and 5), and manages the soft tissue much as would be done for a physical (ie, VPS) impression. Some of the systems (LAVA C.O.S. and CEREC, for example) require the application of a contrasting powder before scanning. The digital impression unit is placed chairside in the operatory, where the screen can be seen by the operator. The operator then scans the prepared arch, the opposing arch and the bite using the intraoral wand (Figure 6) to take a series of digital images (iTero, E4D, CEREC) or a digital video (LAVA C.O.S). Each system uses a unique and proprietary technology to achieve the capture of the digital scan data, and each system requires a slightly different technique. The scan process takes an average user 3 to 4 minutes. Beginning users may find that they need a few minutes longer per scan as they learn how the technology operates.

All 4 devices are also capable of taking full-arch scans, as needed. In addition, most offer adaptors for use on all major articulator systems. No changes to preparation designs or preparation dimensions are needed. Most systems offer the unique advantage of being able to determine the exact occlusal clearance through the use of a digital "color map." This is a huge advantage over the traditional physical impression materials, where the exact amount of occlusal reduction cannot be accurately seen until after the case arrives at the dental laboratory and is made ready for fabrication of the restoration. Avoiding the need for a second preparation and impression appointment due to lack of occlusal clearance has obvious benefits for both the dentist and the patient.

Following the scan, the clinician confirms that the preparation and other relevant areas on the digital model (Figures 7 and 8) have been accurately recorded, and that the occlusal clearance is appropriate for the material

Fig. 4: Failing restorations and edentulous site prior to preparation.

Fig. 5: The fixed partial denture preparations are completed.

Fig. 6: Each system has a different approach to the imaging technology and, as a result, each wand has a different appearance and operates in a unique way.

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selected. Some systems allow the user to annotate the preparation scan to indicate the desired margin position in cases where the answer may not be obvious. Following the digital scanning process, provisional; restorations are placed.

In the background, the digital impression unit is compiling the scan data and preparing it for export. Once ready, the data is sent through a wireless router to the appropriate model facility or laboratory. With the aid of a software program, a trained digital technician will digitally mark the margins, and then digitally ditch and trim the dies. The digital model is now ready to become a physical model. With most current systems, a physical model will be milled (iTero) or SLA printed (C.O.S) (Figures 9 and 10) from which the technician can work in much the same way they always have, but now with the accuracy and convenience of a more durable resin model. This model is then shipped to the clinician's dental laboratory of preference. The models will generally arrive at the laboratory within 3 days of the original scan. With this model, the technician can fabricate any type of restoration, from feldspathic porcelain to zirconia to gold. Alternatively, some of the systems now offer the laboratory the ability to mill the restoration directly from the digital data without the use of a physical model. This can be a bit unnerving for the clinician and technician who are accustomed to checking and adjusting the restoration on a physical model, though it does offer a significant savings in time and cost.

Once completed in the laboratory by the technician, the final restoration is delivered to the clinician (generally within about 2 weeks of preparation) for cementation (Figure 11). Most users report that the cementation procedure is dramatically shorted and more often adjustment-free as compared to their experiences with traditional physical impression materials.

The stand-alone digital impression units (iTero and LAVA C.O.S.]) are well-suited for the clinician who wants to bring digital technologies into their practice, but wants to retain the options and expertise which their dental laboratory technician can provide. Digital impression units also have a fairly short learning curve and require no changes to office protocols/job responsibilities.

Fig. 7

Fig. 8

Fig. 7: The digital model allows the user to verify that all critical areas have been appropriately captured.

Fig. 8: Most systems (the LAVA C.O.S. is shown here) allow the user to check the preparations using high definition images equivalent to 20x magnification on an operating microscope.

Fig. 9: The LAVA C.O.S models are "printed" using a stereolithography apparatus.

Fig. 10: The definitive PFM fixed partial denture is fabricated using traditional laboratory techniques.

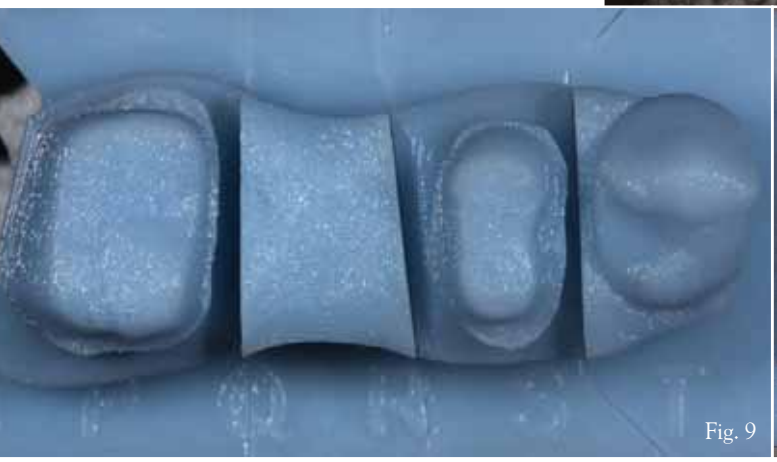

Fig. 9

Fig. 10

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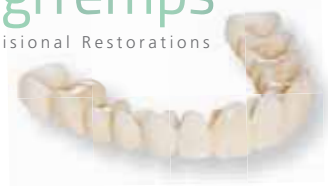

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The preoperative area is scanned, then, once the tooth preparation has been completed, the dentist or assistant will scan the area with the intraoral wand and capture the appropriate series of images (3 to 9 images for a single restoration) of the prepared arch, the opposing arch, and, as needed, the occlusion (bite). This process generally takes about one to three minutes to complete depending on the user skill and case size and complexity. After the images are taken, the unit will compile the data and create a 3-dimensional model (no longer a "cast"). On this digital model, the user will check the bite alignment and scan to ensure accuracy, and then mark the margin with a digital marking tool. The software in the unit will now render a proposal for the restoration (Figure 12). The user then checks the contours, contacts, thickness, and anatomy of the prepared restoration design. Both systems offer a wide variety of tools to reshape the proposed tooth form. A great benefit to this digital technology is the ability of the dentist to create the contacts and contours to their exact demands. Once completed, the restoration proposal is sent to the CAD/CAM milling chamber. The appropriate block is inserted into the chamber, and the mill is started. About 5 to 15 minutes later the restoration is nearly complete (Figure 13). The sprue is removed from the restoration, the restoration is tried in, and the contacts and margins are checked. Appropriate adjustments are made and the restoration is ready for finishing via polishing, staining, crystallization (as needed) and/or glazing.

The in-office CAD/CAM systems offer the amazing and distinct advantage of giving full control of the restorative process to the dentist. Patients obviously love the possibility of having their porcelain restorations done in one visit. Dentists greatly appreciate the speed, and control of these systems, in addition to the significant reduction in lab bills. As a result, there is a great potential for a high return on investment with in-office CAD/CAM systems.

The in-office CAD/CAM system is well suited to quadrant dentistry; they are however also capable of creating veneers and bridges. For more aesthetic and complex cases, where the expertise of a trained lab technician is needed, the scan data can be exported to a laboratory (via CEREC Connect or E4D Sky) to have

Fig. 11: The FPD is cemented to place, and required no occlusal or interproximal adjustments.

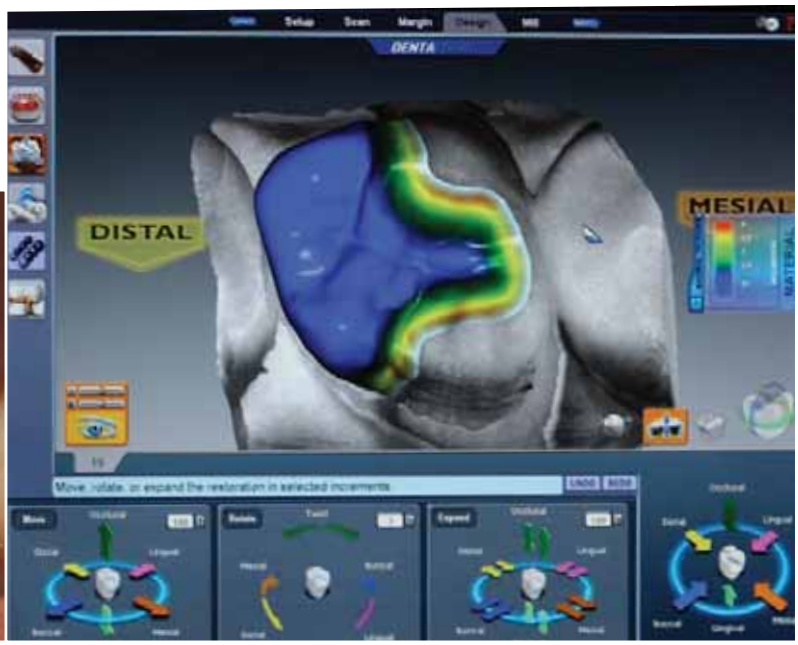


Fig. 12: The CAD/CAM systems (CEREC and E4D [shown here]) allow the dentist to check and modify restoration thickness and contacts before the fabrication process has even started. The color-coding on the onlay represents the varying thickness of the final restoration.

more complicated or sophisticated restorations fabricated. These systems are also now able to accept cone beam computed tomography (CBCT) data and integrate this information with the intraoral scans for exceptional control over the implant treatment planning process (via E4D Compass and CEREC 3D planning.)

Digital Impression Units Versus Complete In-Office CAD/CAM Systems

The patient is fully satisfied with the aesthetic, phonetics and masticatory rehabilitation, all aspects of the function appear stable, plaque control is satisfactory and motivation for periodic inspection is persistent.

We could not avoid thanking the team of dentists-dental technicians who contributed admirably to the implementation of this rehabilitation, and special thanks to the patient who made it possible to write this article.

Digital Impression Units Versus Complete In-Office CAD/CAM Systems

Clinicians looking to purchase a digital system are often confronted with a great deal of confusion in deciding which system would be right for them and their practice. The first important decision to make is whether they want a stand-alone digital impression unit or a complete CAD/CAM system. There is not one right answer for every practice and all the units on the market today have strong track records.

There are several things to consider when investing in a digital impression system. Perhaps the biggest question to answer is whether or not you want to minimize the work done by the laboratory technician. Digital impression units (ie, iTero, LAVA C.O.S) still allow the dentist to take advantage of the technical expertise and experience of the lab technician, in-office CAD/CAM systems (ie, CEREC, E4D) do not. However, the in-office CAD/CAM systems (ie, E4D and CEREC) have the potential for a high return on investment due to the reduction of interaction with the laboratory.

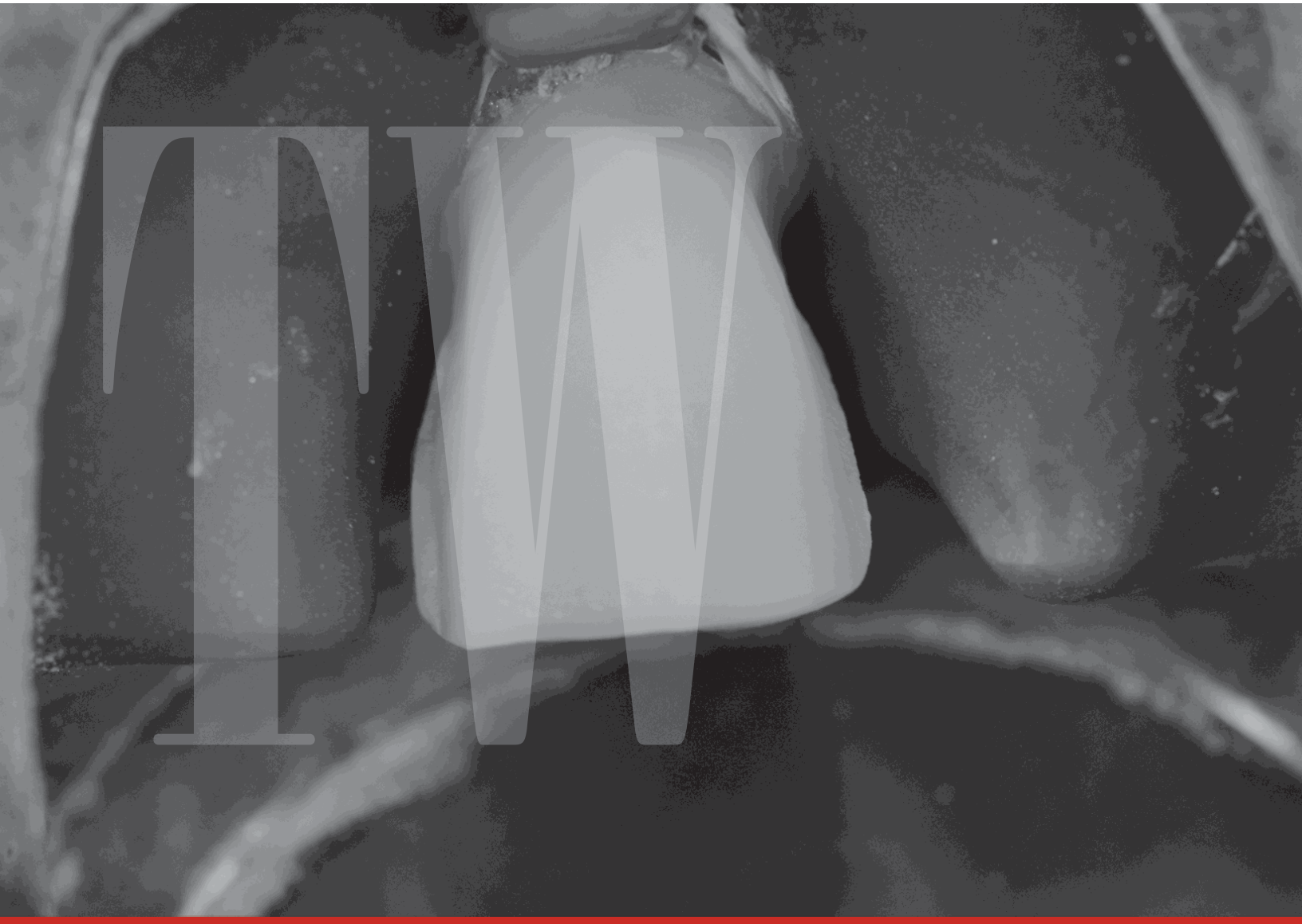
It is also important to consider material selection. The stand-alone digital impression units allow the clinician to use any currently available material, from gold and PFMs to zirconia (ie, LAVA) to feldspathic (ie, Vita VM 13). In-office CAD/CAM systems are primarily designed for use with different millable porcelains (ie, Vitabloc Mark II [Vident]; or IPS e.max CAD and IPS Empress CAD [Ivoclar Vivadent]), composite materials (ie, Paradigm MZ100), or the latest resin nano ceramic (ie, Lava Ultimate [3M ESPE])

Closing Comments

Digital impression and CAD/CAM systems have already completely revolutionized the dental laboratory industry. It is only now, after being on the market for over 25 years that the clinical digital impression units and CAD/CAM systems have really begun to take off in popularity. The technology gets more accurate, more efficient and more intuitive with each upgrade, and now clinicians of all types have begun to see the distinct advantages these technologies have to offer.

In the coming moths and years, there will be a flood of new improvements and newly introduced devices. In 2012 alone 3 more devices were released in the United States: Trios (3Shape), IOS Fastscan (Fastscan Technologies), and Directscan (Hint Els).

The increased competition in the digital impression and CAD/CAM fields will result in rapid innovation.These technologies have already begun to dramatically change what dentists and patients expect. The biggest paradigm shift in dentistry since the introduction of dentin bonding agents is well underway and the development and subsequent applications of these technologies will undoubtedly revolutionize the practice of restorative dentistry. TW



Cosmetic

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Authors:

Gérald Ubassy, dental ceramist, gold medal prize-winner of best workmen of France contest in 1986, directs his own laboratory since 1982. Author of 3 books: "Shapes and Shades" the keys to success in dental ceramic porcelain (Quintessence Publishing Co.), translated into 7 languages and, a book for communication regarding natural teeth "ANALYSIS", the New Way in Dental Communication, Publishers "M.E.A" as well as a last book about his work philosophy and all his hints: "Tips and Hints" translated in 9 languages, publishers "Teamwork media srl".
Organizer for the last fifteen years of practical training courses in his International Dental Training Centre in ROCHEFORT du GARD. He always shares and communicates his knowledge in his lectures and training courses.

Dr. Stefen Koubi
Marseille, France
koubi-dent@wanadoo.fr

The loss of the interdental papillae is a grave consequence of periodontal disease. Surgical reconstruction is still not feasible. There are several approaches to reducing or masking the black triangles which occur as a consequence of the missing papillae. Conventional restorations are an option if the teeth additionally show increased mobility. If this is not the case, that is, if the periodontal tissue is healthy, it is crucial to find a biomimetic solution, meaning that the restoration should take esthetic, biomechanical and biological factors into account.

Initial situation

The treatment of missing papillae by means of ceramic veneers will be presented on the basis of a clinical case. A female patient aged around forty was unhappy with the look of her smile, which she described as "disgraceful".

The esthetic diagnosis consisted of an analysis of the features of the face, the smile, the teeth and the gingiva.

The analysis (Fig. 1) revealed the following findings:
- Face: tense and shy look due to self-consciousness about her teeth.
- Smile: considerable esthetic compromises due to the black triangles.
- Teeth: healthy triangular, curved teeth; the margins of the roots are visible.
- Gingiva: healthy periodontal tissue; interdental papillae are missing; the teeth are stable; recess at tooth 12.
- Radiological examination: regular alveolysis in the cervical third.

Procedure

The following procedure was determined on the basis of the analysis:
- surgical intervention at tooth 12 in order to increase the gingiva (transplantation of connective tissue)
- fabrication of a mock-up in order to visualize the final result
- tooth preparation on the basis of the mock-up
- temporization
- try-in of the veneers (adaptation, shape and shade)
- incorporation of final restoration.

Treatment course

Surgical intervention to increase the gingiva

Connective tissue was removed from a lobe which was moved towards the tooth crown. Before further treatment was conducted, a four-month healing phase was necessary.

Preparing the mock-up

A silicone matrix was fabricated on the basis of the wax-up, which was based on the findings of the esthetic analysis. The temporary restorations were fabricated with the help of the matrix from a self-curing, flowable Bis-GMA-based composite. This allowed us to discuss the restoration beforehand with the patient, who provided her input and approved of the restoration (Fig. 2).

Preparation

In order to keep the depth in check and observe the biological concept, the drill was placed directly on the mock-up. With this procedure, a uniform thickness of approx 0.5 mm is achieved on the basis of the volume of the final restoration (cf Gurel 2006). After removing the preparation key (mock-up), the presence of larger, non-prepared enamel areas is observed. In the present case, the treatment protocol was slightly varied in view of the cervical preparation margins. Usually, the preparation margins are located above the gum line for veneer preparations; in this case, however, the margins had to be designed subgingivally (Fig. 3). This approach was chosen for various reasons: In order to eliminate the black triangles, meet the biological requirements (cleaning and soft edges) and take the biomechanical properties of the ceramic (preventing non-supported areas in the ceramic) into account, only one single contact surface with a soft transition from the edge of the root to the margins of the contact surface could be designed to mask the missing papillae (Fig. 4).

The all-ceramic veneers were fabricated with the IPS e.max® Press (MO1) lithium disilicate glass-ceramic material, and the incisal third was veneered with IPS e.max® Ceram. The pressed veneers, which showed a minimum thickness of 0.3 mm, feature a high stability and

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 1: Preoperative view

Fig. 2: Mock-up

Fig. 3: Preparations with subgingival margins in the proximal region

Fig. 4: Checking the relation between the preparations and the volume of the final restoration with the help of a silicone matrix

Fig. 5: Isolating individual teeth in order to achieve optimum bonding

outstanding accuracy of fit on the one hand and excellent light-optical properties on the other.

Try-in of the IPS e.max Press veneers

After removing the temporary restorations, all veneers were tried in simultaneously. This enabled the overall appearance to be visualized. Subsequently, the accuracy of fit was checked. Variolink® Veneer Try-In paste was used for this procedure to simulate the effect of the cementation material on the shade of the restoration.

Clinical procedure

The veneers were individually cemented in the adhesive technique, starting with the incisors (Fig. 5), followed by the lateral incisors and canines and so on, thus allowing the clinician to carry out corrections on the proximal areas of the less prominent teeth (distal surfaces of canines or premolars). The restorations were conventionally placed with Variolink Veneer. In a last step, the composite joints were carefully finished with a scalpel in order to maintain the surface gloss of the ceramic and the excellent fit in the periodontal tissue (Figs. 6 to 8).

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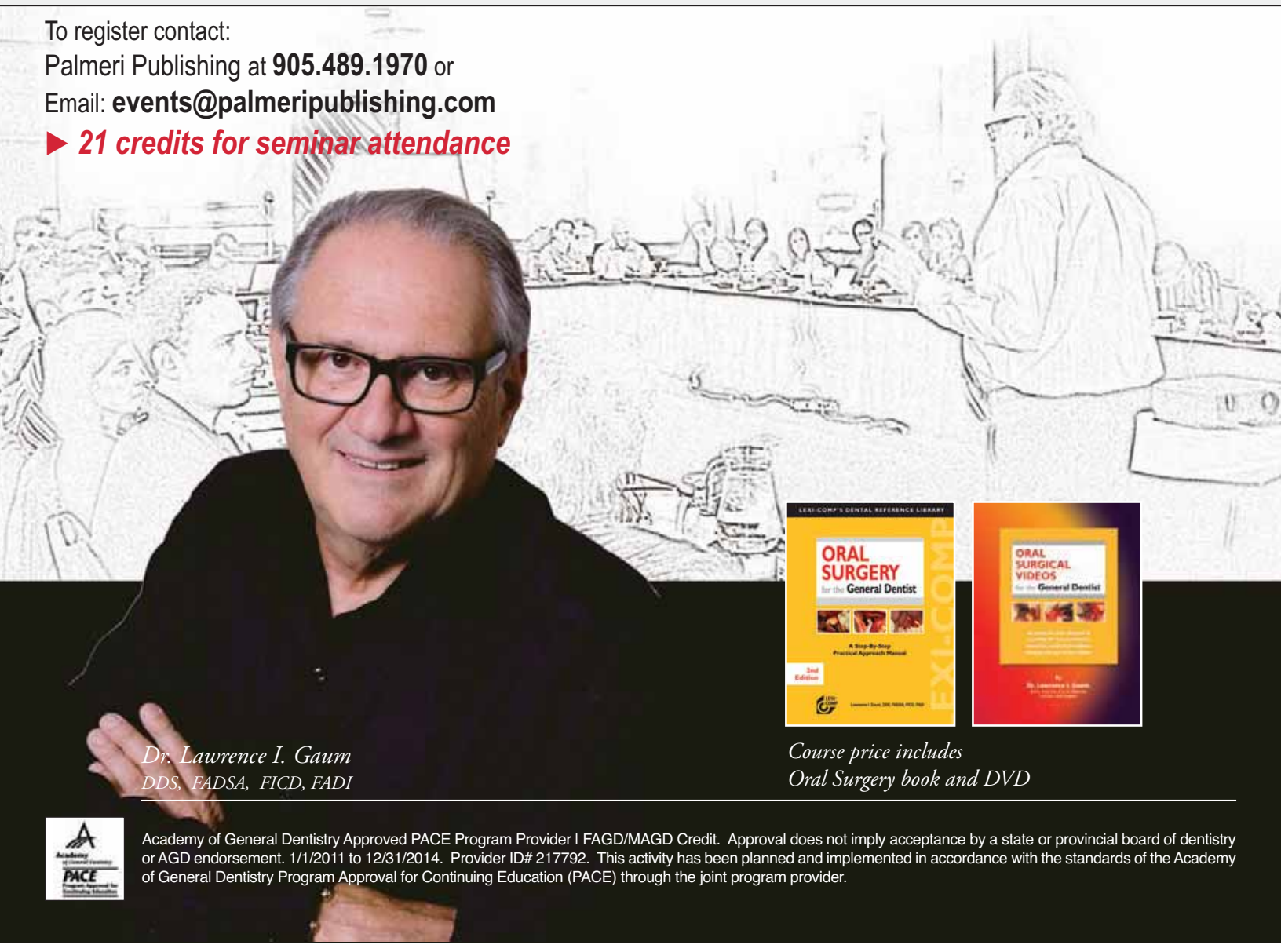

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Fig. 6


Fig. 7


Fig. 8


Fig. 9


Fig. 10

Fig. 6: Lateral view of the IPS e.max Press veneers (from right)

Fig. 7: Lateral view of the IPS e.max Press veneers (from left)

Fig. 8: Frontal view of the restorations. An expansion of the interdental papillae can be observed.

Fig. 9: View of the maxillar teeth. The optical properties of IPS e.max Press material are particularly highlighted in this image.

Fig. 10: Light transmission through IPS e.max Press veneers

Note

Clear communication between the dentist and the dental technician is mandatory in clinical cases such as this to allow as much information as possible to be exchanged (models, images of the initial situation, images of the preparations and their shade, impression of the temporary restorations in place, shade determination). In the present case, it was agreed with the ceramist to design the margins of the contact surfaces on the stone model two millimetres from the papilla, because, for the papilla to grow back, the distance between the contact point and the tip of the papilla must be less than five millimetres (Tarnow).

After some months, the papilla will have grown and filled the small spaces that were reserved for it. This is also a confirmation of the biocompatibility of the lithium disilicate glass-ceramic IPS e.max Press (Figs. 9 and 10).

By strictly observing the treatment strategy and using materials which show optimum optical and biomechanical properties, the patient's smile was modified and restored while abiding by the principles of minimally invasive dentistry.

I would like to thank Gérald Ubassy for his cooperation and his exceptional talent. TW

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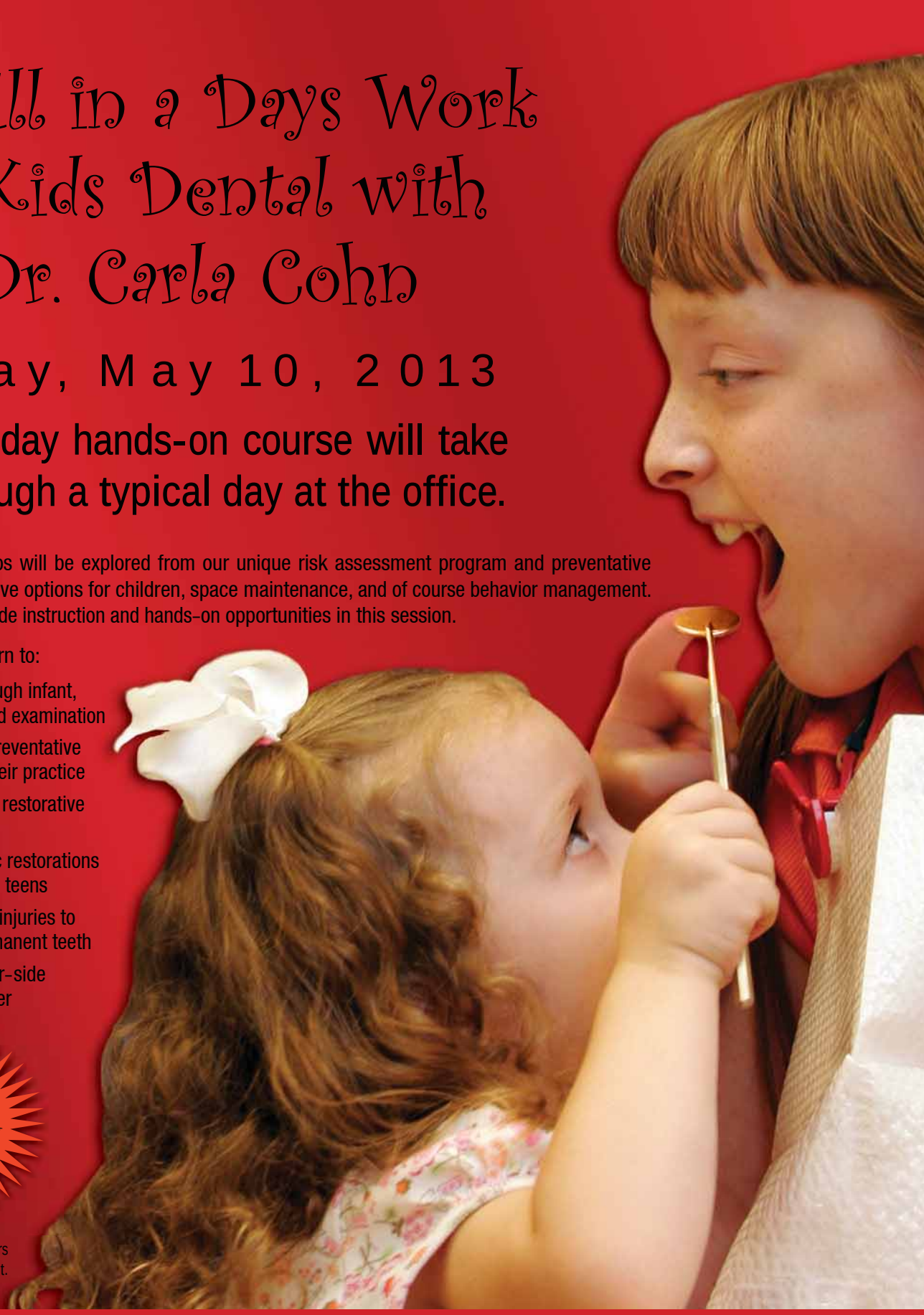

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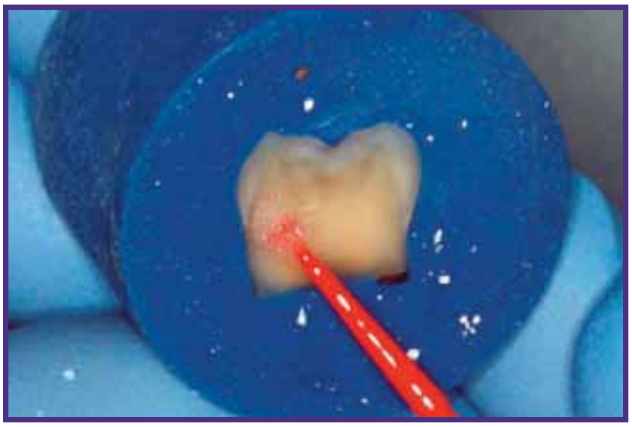

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A Historical Review of Study Club Development in the Pacific Northwest

L'historique du développement des cercles d'étude dans le Pacifique nord-ouest

Abstract

Every person has two educations—that which is given to them, and the other, that which one gives to themselves. Of the two kinds, the latter is by far the most valuable. Indeed, all that is most worthy in a person, they must work out and conquer for themselves. It is that that constitutes our real and best nourishment. What we are merely taught seldom nourishes the mind like that which we teach ourselves.

— Jean Paul Richter (German Novelist) 1763

Résumé

Chaque personne a deux sortes d'éducations – celle qui lui est donné et celle qu'il se donne. Des deux, la dernière est nettement la plus satisfaisante. En effet, ce qui est le plus important dans une personne, on doit l'accomplir et le conquérir pour soi-même. C'est cela qui constitue notre vraie et meilleure nourriture. Ce qui nous est seulement enseigné, rarement nourrit l'esprit autant que ce que nous enseignons à nous-mêmes.

— Jean Paul Richter (Écrivain Allemand) 1763

The Origins of The Pacific Northwest Study Clubs

The Study Club concept and movement began with the iconic and world-renowned father of modern dentistry, Dr. G. V. Black. Dr. Black actually had little formal education, yet he aspired to and became one of the most influential scholars in modern dentistry. At the age of seventeen he decided to study medicine at his brothers office, Thomas G. Black who was a practicing physician at Clayton, Illinois. After 4 years of study (1853-56) gaining knowledge in anatomy and medicine from his brother, he began to study dentistry under J. C. Speer who was a practicing dentist at Mt. Sterling, Illinois. The young Black assisted Dr. Speer in his work for only a few months and with the little formal education and the knowledge of basic sciences that he accumulated, he set up his own dental practice at Jacksonville, Illinois in 1856. Dr. Black, however, was an irrepressible seeker of knowledge and his inquisitive mind gave rise to an incessant barrage of inventiveness and ideas. He would go on to become one of the most prolific researchers and teachers of the dental profession. In 1908, Black's monumental work, Operative Dentistry, appeared in two volumes, which was the magnificent culmination of his long and fruitful labours. From 1864 to 1915 he had produced more than 1300 papers and addresses on scientific and professional subjects and in 1915 he produced his third volume of Operative Dentistry. Being a natural born teacher, he analyzed the problems of education and teaching and devised curriculums to improve the dissemination of knowledge. In 1897, he became Dean of Northwestern University Dental School where he served in this capacity for seventeen years. Dr. Black ultimately became the foremost leader in dental education and helped build one of the leading Dental schools in the world.

In 1898 in St. Paul, a group of Minnesota dentists inspired by Dr. Black, prevailed on him to travel to Minneapolis to share his knowledge and his ideas and with them. Dr. Black agreed and so began the mentorship of a small group of leading individuals which would become the first known dental study club in North America. This study club was oriented to fostering a collaborative effort for the improvement of clinical dentistry and personal

development. The Black study club was both innovative and stimulating, giving conceptualization to the idea of organized and personalized continuing education. The Black Study Group stimulated a novel and fresh inspiration to practitioners of dentistry to seek out refinement and excellence in their profession.

Word of the Black study club began to spread and in Seattle the desire to develop a study group based on the G. V Black's program took root. In 1907, on the 26th of October, a very small group of enthusiastic dentists gathered together to organize the "Odontological Study Club Of Seattle". Their objective was to follow the G.V. Black model of study club activity. Eventually, the group was reorganized and renamed the "Seattle Dental Study Club". After struggling for considerable time without a definitive leader, Waldon Ferrier, who was a star member of the Seattle Study Club was appointed in 1923, to be their "Master of Clinics". Dr. Ferrier was influenced and greatly impressed with the philosophy and techniques of Dr. G. V. Black as well as with F. K. Wiedelstaedt. While thoroughly believing in the philosophy of Dr. Black, he came to believe that Dr. Black was too radical in applying his principles of "extension for prevention" and that he unnecessarily destroyed a great deal of tooth structure. Doctor Ferrier spent much time searching for a more conservative application of the principles of Dr. Black. In this pursuit, he was highly successful, developing new instruments, clamps, spreaders, as well as more conservative concepts of tooth preparations based on his preferred restorative medium, gold foil.

Dr. Ferrier and his Study Club became renowned, in large part because of the high discipline he imposed on himself and on his followers. Ferrier would appoint himself or one of his handpicked instructors to teach. He would lay down strict obligations for membership. These obligations were clear, well defined and enthusiastically enforced. Regular attendance at meetings would be a member's first priority as would be the willingness to operate and submit one's clinical work to criticism from both the mentor and the membership. As time went on he continued his study club work, helping personally to organize many more clubs in Seattle, Portland, and in Vancouver and Victoria, British Columbia. Each Study Club would have twelve members only, (considering the way Dr. Ferrier presided over his groups his students were sometimes referred to as "disciples"). He personally supervised the training of approximately 200 clinicians during his career. Most of those who came under his influence adopted his values of idealism, dedication and devotion. Dr. Ferrier's approaches to operative dentistry were now receiving national and international recognition and more and more dentists wished to become associated with his concept of personalized instruction and self-improvement. Each group, as it came into being, would be an exclusive group, committed to the highest standards, and very aware that they had been admitted to a new ensemble of twelve operators where membership was a distinct privilege.

Ferrier's influences fostered a whole subset of Study Clubs, in turn mentored by dedicated and talented clinicians. Vancouver, Canada was one place fortunate to have a pioneer Ferrier Gold Foil Study Club. It was initiated by Dr. Ferrier and assigned to be mentored by Dr. Ellsperman, one of Ferrier's original twelve Study Club members. Owing to failing health, Doctor Ferrier retired from practice in 1950 after which he divided his time between his followers in British Columbia, Seattle, Washington and Southern California. He died on November 11, 1965.

Although his star shone brightest, Dr. Ferrier was not the only leader in the region. There were also other existing great operators and teachers in the Pacific Northwest who influenced Ferrier, such as Weidlestaedt , Hollenbach, Searle and others. The Pacific Northwest at that time was becoming a breeding hotbed of talent that was moving into a second generation. It was Dr. Gerald Stibbs who rose to the top of that talent pool.

Dr. Stibbs became renowned in his own right. He helped to establish and then served as the first Chairman of University of Washington's Operative Dentistry Department. He chaired there from 1948 to 1970. It was Dr. Ferrier who was influential in posting Dr. Stibbs into U. of W. During his tenure, Dr. Stibbs was a popular leader who managed his department with great effectiveness. Among his personal mentor influences were Dr. Ferrier, Dr Hollenbach and Dr. Weidlestadt. Dr. Stibbs actually was a Canadian, born in Schrieber, Ontario. After graduating in Dentistry in 1939 he set up a mobile dental clinic in British Columbia before beginning his academic career in Washington State. He also assumed the mentorship of the Vancouver Ferrier Gold Foil Study Club from Dr. Ellsperman and became involved with others.

Until his death in 1993 at the age of 82, Dr. Stibbs continued to be a mentor to three principal dental study groups, two in Vancouver, Canada, one of them being the original Vancouver Ferrier Study Club, originally mentored by Dr. Ellsperman, the Walter K. Sproule Study Club and also the George Ellsperman Gold Foil Seminar group in Seattle. Each of these Study Clubs comprised the traditional twelve-member structure model of Dr. Ferrier. The protocols remained the same: attendance, discipline and the performance of operations with welcome critique

of and by each other. Dr. Stibbs's influence garnered widespread support, fostering many other famous clinicians inside and outside of Seattle.

So it continues to present day with Dr. Richard Tucker, from Ferndale Washington, a protégé of Dr. Ellsperman and Dr. Stibbs, who has carried on the legacy, organizing the Study Club model of twelve members as initiated by Dr. Ferrier and following the same standards of excellence and commitment and self-exposure to critique. Dr. Tucker assumed the mentorship of the original Vancouver Ferrier Gold Foil Study Club from Dr. Stibbs, as well as many other Ferrier Affiliated groups.

Presently, Dr. Tucker's influence outreaches even beyond what Ferrier and Stibbs could accomplish with their impressive Study Club movements. Amazingly, over seventy Richard Tucker Study Clubs exist today and which are actively thriving worldwide. His students carry on the enthusiasm and message developed by the path of those dedicated mentors before him.

The pedigree of mentorship is well embedded in the dental history of the Pacific Northwest, and perhaps nowhere else is it established quite as well. Today there are scores of hands-on mentoring programs in Washington, Oregon and in British Columbia. The objectives are a continuum; the sharing of knowledge and the inspiration to become better through constructive criticism.

While continuing education is readily available and Study Clubs abound, for the most part they are based on the lecture model, some of which can host hundreds of audience members. It is however, unique and special to have the personalized one-on-one, mentor-to-student and student-to-student interaction that was structured so successfully by Dr. Black and Dr. Ferrier. Personalized mentorship stands out as a different kind of dedication in today's complexity of broad-spectrum conference technology and Web broadcast continuing education.

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Gestion clinique des caries radiculaires

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Abstract

Root caries is a pervasive problem for a high percentage of elderly patients.[1 & 2] (FIGS 1, 2 & 3) Many of these patients have had extensive restorative dentistry done over their lifespan. Approximately 38% of patients between the ages of 55 and 64 have root caries while 47% of those between 65 and 74 have experienced root caries.[3] The incidence of root caries in old-old subjects (over 75 years) is even higher.[4]

Résumé

La carie de la racine est un problème envahissant pour un grand nombre de patients âgés.[1 & 2] Beaucoup de ces patients ont eu d'importantes restaurations dentaires faites durant leur vie. Environ 38 % de ces patients entre les âges de 55 et 64 ont eu des caries de la racine, alors que 47% entre les âges de 65 et 74 ont éprouvés des caries de la racine.[3] L'incidence des caries de la racine chez les sujets très âgés (75 ans et plus) est encore plus élevée.[4]

One of the primary etiologic factors for these patients is their use of prescription drugs for a wide variety of systemic medical problems. It has been estimated that 63% of the 200 most commonly prescribed medications have a side effect of dry mouth.[5] It is the subsequent reduction in salivary flow rates and concomitant diminished buffering capacity resulting from use of these medications that is primarily responsible for the increase in root caries in elderly patients.

With all elderly patients a caries risk assessment should be carried out. There are several ways to do this, but in general the past history of caries is the best indicator for future risk.[6 - 9] Patients with gingival recession, poor oral hygiene, a cariogenic diet, multiple restorations, multiple missing teeth, existing caries, who are taking xerogenic medications, or who have compromised salivary flow rates for any reason may be considered at high risk for root caries.

Once it has been determined that a patient is at high risk for root caries, an aggressive preventive protocol should be considered. This protocol is based upon 4 primary strategies for prevention of future root caries. The first strategy is to try and increase salivary flow rates and improve the buffering capacity of the saliva. The second strategy is to try and reduce the numbers of cariogenic bacteria (S. mutans) in the oral cavity. It should be noted that multiple bacteria in a complex biofilm contribute to the development of root caries, but S. mutans is the species of bacteria that initially colonizes the root surface and the other species of bacteria only contribute after the initial biofilm is formed.

The third strategy is to reduce the quantity of exposures of ingested refined carbohydrates and the fourth is to attempt to remineralize incipient lesions and prevent new lesions from developing. Many of the specific procedures that will be recommended may have an impact in multiple areas.

The following protocol is based upon these 4 primary strategies and is applied 1 of 2 ways. If the patient has active, cavitated lesions, a 2 stage protocol is followed, with the first stage intended to significantly reduce the numbers of S. mutans in the oral cavity and the second

***(This article's content was presented by Dr. Terry Donovan at CARDP's Toronto 2011 Annual Scientific Meeting.)**

stage intended for long-term maintenance. If the patient is deemed to be at high risk but does not yet have active root caries lesions, the initial phase can be omitted and the long-term preventive protocol is employed.

I: Initial phase to reduce the number of oral S. mutans:

1. Perform an initial salivary evaluation.[10] One of the strategies to combat root caries is to attempt to improve salivary flow rates. Thus, it is important to obtain some baseline data prior to initiating the preventive protocol so that objective measurements can be taken over time to evaluate improvement. A kit is currently available that permits collection of saliva and will determine salivary consistency, resting and stimulated pH, stimulated flow rate and buffering capacity. (Saliva Check, GC Corp., Scottsdale, AZ) These data can be compared with benchmarks for xerostomia, but more importantly can be used with similar data collected after implementation of the protocol to evaluate efficacy.

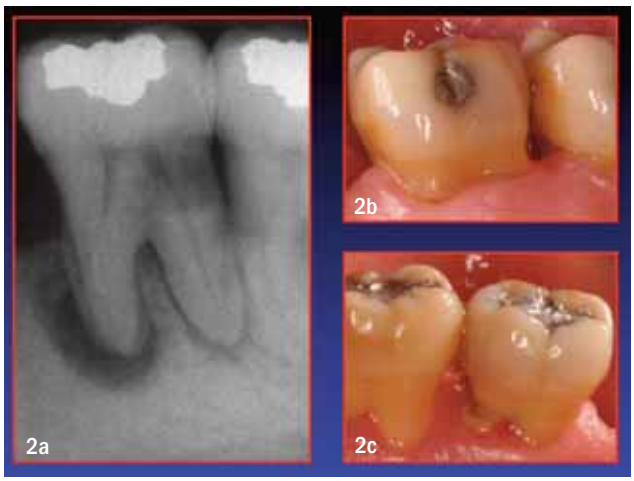
2. Obtain an accurate list of the medications the patient is taking, along with the dosage and frequency of use. Evaluate these medications for their xerogenic potential. In consultation with the patient's physician, it may be possible to prescribe less xerogenic medications, or to reduce the dosage. Changing the time of ingestion from evening to morning may be beneficial. Prescribing a salivary stimulant such as pilocarpine may be considered. A dose of 5mg. pilocarpine 3 times per day is initially prescribed and the dosage can be gradually increased to 10mg. 3 times per day if monitoring indicates dosage should be increased.

3. Perform an initial microbiological evaluation. Studies have determined that the primary etiologic agent in root caries is S. mutans.[11] It is critical to reduce high levels of S. mutans in susceptible patients. When the caries risk assessment determines that a patient has a moderate to high risk for caries, an initial screening test should be made. A relatively simple device that measures the amount of adenosine tri-phosphate (ATP) in the saliva is available. (Cari Screen; Oral Biotech; Albany, OR). The amount of ATP in the saliva roughly correlates with the numbers of S. mutans and the test can be accomplished in about a minute. Use of such objective data can also be quite motivational for patients as they can readily see positive results if their scores improve. More information on this relatively new product can be obtained at www.carifree.com.

4. Gross carious lesions should be excavated as quickly as possible and restored with Fuji IX. (GC Corp.) It is not essential at this stage to completely remove all caries, just get the bulk of the leathery caries out and seal the lesion. This procedure significantly reduces the numbers of S. mutans in the oral cavity.

5. Prescribe a 0.12% chlorhexidine gluconate mouth rinse (Peridex Mouth Rinse; Procter and Gamble Pharmaceuticals, Cincinnati, OH)). Patients should be instructed to do a 60 second (by the clock) mouth rinse twice a day. Chlorhexidine is a powerful plaque reducing agent and will quickly reduce the numbers of micro-organisms in the mouth. This should be done for a period of 2 weeks and another test for ATP levels conducted. If levels are significantly reduced, use of the chlorhexidine rinse can be discontinued. Side effects of the use of chlorhexidine are staining and taste alteration.

Figures 1a & b — Root caries lesions are difficult to restore and manage.



Figures 2a, b & c — Root caries lesions like this lesion on a mandibular molar are often impossible to restore.

Figures 3a & b — Root caries frequently occur in elderly, previously restored patients.

6. Apply 5% sodium-fluoride varnish (Vanish XT, 3M-ESPE, St. Paul, MN) to all exposed root surfaces. Repeat this procedure every 3 months. Fluoride varnish has well-documented efficacy and does NOT require patient compliance.[12] Fluoride varnish will reduce the numbers of bacteria and also works by promoting remineralization of tooth structure.

7. Prescribe an SLS free prescription fluoride tooth paste (Prevident 5000 Dry Mouth, Colgate Pharmaceuticals, New York, NY). Patients should be instructed to use this 3 times per day. SLS is sodium lauryl sulphate and provides a detergent like action to toothpastes. However, some studies have shown that it interferes with the plaque reducing effect of chlorhexidine.[13 & 14] The recommended prescription toothpaste does not contain SLS and thus prevents the potential negative interaction.

8. Ask the patient to complete a 4 day diet record. The patient should write down everything they ingest, the amount and the time for 4 days, with 2 of those days being on the weekend.[15] This should be analyzed for the amount of refined carbohydrate. One major culprit for patients with dry mouth is flavored candy such as breath mints. Dietary recommendations should be made that eliminate or reduce refined carbohydrates. Sugar-free breath mints are highly recommended as they tend to increase salivary flow rates and are not cariogenic.

9. Suggest that the patient use an automated toothbrush (Triumph Sonic Toothbrush, Oral-B, South Boston, MA, Sonicare Sonic Toothbrush, Philips Oral Healthcare Inc., Snoqualmie, WA.). It is critical that patients susceptible to root caries practice meticulous oral hygiene. However, many of these patients have physical and visual deficiencies and this makes it difficult for them to adequately cleanse the mouth. For these patients, an automated toothbrush may be advantageous. If the patient can physically accomplish it, daily use of a water irrigation device (Waterpik, Water Pik Inc., Fort Collins, CO) is useful. While it will not remove plaque, studies have shown daily use will change the composition of the plaque in a beneficial way.

10. Instruct the patient to use xylitol chewing gum 3 times a day (5 minutes after each meal) for at least 5 minutes each time. This gum should be chewed after meals as it has been shown that that is when salivary pH is lowest. Xylitol has a strong evidence base and works by increasing salivary flow rates, causing a mutation of S. mutans to a less cariogenic form, and also assists in remineralization.[3] Xylitol is provided in a number of different products, including chewing gum, toothpaste, mints, candies, mouth sprays and gels, and is even impregnated in dental floss. The internet is a good source for purchasing xylitol products and one site that features a wide variety of products is www.Dentist.net.

11. Instruct the patient to apply amorphous calcium phosphate (MI Paste, GC Corp.) with the finger to all exposed root surfaces prior to going to bed at night. This paste contains both calcium and phosphate and helps remineralize the tooth surface.

12. After this protocol has been in place for 2 weeks, redo the microbiological evaluation. Usually the scores will show a dramatic improvement and the patient can now be moved to the long-term prevention/maintenance phase. If the scores have not dropped sufficiently, continue the above protocols for another 2 weeks or until the scores improve.

II: Long-term prevention/maintenance phase:

13. Restore all root caries lesions with a fluoride releasing material. All Fuji IX restorations should be removed and all active caries removed. Resin-modified glass ionomer materials (Ketac-Nano, 3M-ESPE) are preferred primarily because they bond effectively to both enamel and dentin and they act as reservoirs for fluoride which can be re-released into the oral cavity.[16 & 17] They are

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are effective as anti-caries materials ONLY if patients reload the material a minimum of 3 times/day by brushing with fluoride containing toothpaste or use of other fluoride containing products. Educating patients of the necessity of 3 exposures to fluoride per day to reload the fluoride-releasing materials can assist in motivating them to improved levels of compliance.

14. Patients should be placed on a strict 3 month recall where fluoride varnish will be applied after prophylaxis, and salivary and bacterial tests can be repeated as necessary. Patients can now switch back to a regular prescription SLS-containing toothpaste (Prevident 5000, Colgate Pharmaceuticals, Clinpro 5000, 3M-ESPE) because the use of the chlorhexidine mouthwash can be discontinued. Patients definitely prefer toothpastes with a detergent action. The use of xylitol chewing gum and amorphous calcium-phosphate should be continued as described above.

In summary, many elderly patients are experiencing an epidemic of root caries, primarily as a result of the xerogenic side effects of medications prescribed for systemic illnesses. Many root caries lesions occur in locations that make them difficult, if not impossible to restore. The dental profession has a strong track record of prevention, and it is clear that with root caries, prevention is much better than restoration.

This article presents a clear protocol, based on contemporary clinical evidence, that can prevent the ravages of root caries.

Author declaration

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Occlusion as it relates to implant and implant supported restoration survival

L'occlusion en relation aux implants et la pérennité des prothèses implanto-portées


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Abstract

Numerous articles have been written comparing the relation of different occlusal schemes to the survival of dental implants. Most conclusions are based on the opinion of the authors who offer little evidence to support their recommendations.[1] Any consideration, during case planning, involving the merits of one occlusal scheme over others should be predicated on the distinction between failure due to loss of implant integration caused by occlusal force overload (Figs. 1,3) and mechanical failure of the implant(fracture) or implant restoration (Figs. 3-5)

Résumé

De nombreux articles ont été écrits pour comparer la relation de différents types d'occlusion dans la survie d'implants dentaires. La plupart de ces conclusions sont basées sur l'opinion des auteurs qui montrent peu d'évidence pour supporter leur recommandation.[1] Toute considération, durant la préparation d'un travail, impliquant les mérites d'un type d'occlusion plutôt qu'un autre, devrait être attribuée à la distinction entre l'échec, du à la perte de l'intégration osseuse de l'implant causé par une force occlusale trop importante (Figs. 1,3), et l'échec mécanique de l'implant (fracture), ou bien de la restauration de l'implant.(Figs. 3-5)

Introduction

Many articles have been written relating occlusal schemes to the survival of dental implants, most are based on opinions of the authors and little evidence is used to support their suggestions.[1] Before placing too much emphasis on any suggestions purporting superiority of one occlusal scheme over another for implant supported restorations, clinicians should clearly distinguish between failure of an implant due to loss of integration due to excessive forces from occlusion (Figs. 1,2) and mechanical failure of the implant (fracture) or implant restoration.(Figs. 3-5)

Discussion

Functional force loading of an implant has been shown to cause micro-fracture of the peri-implant bone followed by a healing process which results in increased bone density around the implant (remodeling). It is hypothesized that loss of implant integration due to occlusal overload occurs when forces overcome the ability of the peri-implant bone to heal quickly enough to prevent bone loss and eventual deintegration.[2]

Animal studies designed to evaluate the effects of hygiene; load magnitude and non-axial loading on continuing osseointegration of dental implants have been carried out. Gotfredsen induced experimental periimplantitis-like lesions in beagle dogs followed by a static lateral load on the affected implants. No bone loss was observed in the presence of either experimentally induced lucidities or more advanced peri-implantitis.[3] To evaluate load magnitude, Miyata performed an experiment using monkeys as the test subjects. He increased the magnitude of overload to the implants by increasing the degree of hyper-occlusion on the implants. According to his findings, there is a threshold of loading force that results

***(The content of this article was presented by Dr. Winston Chee at CARDP's 2011 Toronto Annual Scientific Meeting)**

Figure 1 — de integrated implant

Figure 2 — extraction wound of implant in Fig.1

Figure 3 — implant fragment

Figure 4 — retained portion of implant fragment from Fig.3 in situ

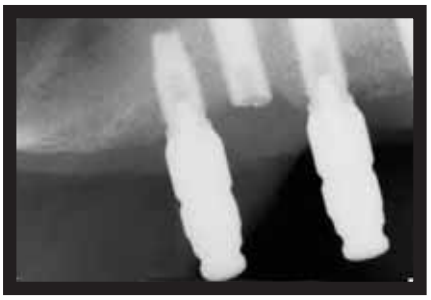

Figure 5 — radiograph of implant fragment in Fig.4 after additional placement of implants

Figure 6 — clinical image of fractured abutment screws

in peri-implant bone loss which is exacerbated by poor oral hygiene.[4-6] Ogisio, also in monkeys, found that implants subjected to hyper-occlusal loading only exhibited bone remodeling and greater bone density in the peri-implant bone.[7] Celliti, also in monkeys, loaded implants in a non-axial direction and found that the implants did not lose integration and failed to develop peri-implant bone loss.[8] Likewise, when bone levels around non-axially loaded implants were evaluated longitudinally over five years , including implants tilted up to 30 degrees no increased peri-implant bone loss was observed when compared to axially loaded implants over the same time period.[9]

Another study attempted to determine if a relationship exists between the magnitude of occlusal load and marginal bone levels around implant retained restorations. Utilizing clinical and radiographic evaluation, 14 subjects with intact dentitions except where implant restorations replaced a missing tooth or teeth were studied. No restorations were present on adjacent or opposing teeth. Maximum biting force on the implant restorations were measured utilizing a strain gauge and a jig to standardize the biting position. Patients were seated upright during testing and no correlation was found between maximum biting force and marginal bone levels around the implants.[10]

A more recent literature review of articles relating occlusion and implant survival found that insufficient evidence exists to promote the superiority of one occlusal philosophy over another.[11] It can be concluded, by a preponderance of the evidence currently available, that there is no validity to the hypothesis that forces of occlusion and mastication can initiate or propagate peri-implant bone loss and resulting loss of osseointegration. Loss of implant integration is likely the result of causes other than occlusion.

Implants lack the ligamentus interface and resulting physiologic mobility of natural teeth. Therefore, restorations on implants are subjected to much harsher forces. This lack of periodontal ligament protection is especially notable in cases where implant supported restorations oppose each other.[11] Complications related to these increased forces are primarily mechanical and range from screw loosening, on the innocuous end of the scale, to catastrophic failure involving implant fracture, in the extreme.

Concerns about occlusion should be directed toward biomechanical issues involved in case design i.e.: factors that effect screw joint stability and restoration survival. Non-axial implant loading force causes the abutment/implant joint to open resulting in screw stretching. If the screw is stretched beyond its' elastic limit, the preload will be reduced and eventually the screw will loosen. In a more extreme situation, the loss of pre-load can result in fracture of a screw not protected by a tight abutment/implant joint.[12] Splinting implant units will reduce these occurrences providing more stability to the restoration-implant complex (Figs.6-9).[13]

Clinically, mitigating the risk of screw failure implies reducing non-axial loading by avoiding occlusal forces on inclines whenever possible. An occlusal design by Weinberg would seem to achieve this by lingualizing the posterior

Figure 7 — retrieved fractured screws from Fig.6

Figure 8 — fractured full arch fixed dental prostheses

Figure 9 — fractured cantilever segment of full arch prostheses from Fig.8

Figure 10 — fractured porcelain from metal ceramic prostheses

Figure 11 — occlusal view of restorations in Fig.10

Figure 12 — poorly supported metal ceramic restorations with unsupported porcelain

occlusion. In this design the cusp fossa relation is modified by creating a flat surface to contact the maxillary lingual cusp. Additionally, splinting restorations whenever possible will reduce the number of rotational axes.[14-17]

Another example of biomechanical complication is the failure of implant restorative materials, especially veneering porcelain. This is most commonly the result of failure to provide adequate metal support for the porcelain veneer and is exacerbated by the lack of ligamentous "shock absorber" effect at the bone-implant interface. Ceramometal restorations for implants should be waxed to full contour and cut back to avoid inadvertent neglect to take into account the relatively more narrow diameter of the implant abutment when compared to a natural tooth full coverage preparation, especially in the molar region. (Fig. 13 restoration doomed to premature failure due to excessive unsupported porcelain)

Implant supported fixed prostheses are predisposed to porcelain veneer fracture not only as a result of fabrication errors, including failure to match metal/ceramic materials, and a lack of resilience. The loss of proprioception is another contributing factor to failure and increases in importance as the number of teeth requiring implant replacement increases. Proprioception loss as a contributing factor in materials failure is in spite of the apparent development of osseo-perception as a compensatory mechanism around osseointegrated implants. This phenomenon has been described as being similar to the ability of lower limb amputees to discern the difference between various walking surfaces and is a learned response.[15]

Conclusion

Support for the superiority of one occlusion model over another is not presently evidence based. However, it would seem prudent to incorporate precautions in the design and fabrication of implant restorations based on biomechanical principles. And, thereby, expect an improvement in the survival rate of dental implants, and their components restorations and materials.

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Effect of Energy Delivered on the Shear Bond Strength to Dentin

L'effet de l'énergie transmise sur les forces de cisaillement affectant les liens à la dentine

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Dr. Jack L. Ferracane, PhD

Abstract

This study examined the in vitro shear bond strengths of two adhesive systems, SingleBond Plus (3M ESPE) and Optibond FL (Kerr), when shades A2 and A4 of Filtek Z100 composite (3M ESPE) were bonded to human dentin using either 3 or 22 J/cm² of light energy. These two energy doses were chosen based on how much energy students delivered to a simulated Class I restoration in a maxillary molar. The shear bond strength data were compared using analysis of variance followed by Fisher's PLSD post-hoc multiple comparison tests.

A three-factor ANOVA showed that overall the shear bond strength was significantly higher by ~ 10.1 MPa in groups that received more energy ($p<0.01$). Overall, the shear bond strengths were greater for the lighter shade A2 of Z100 and for Optibond FL (Fisher's PLSD $p<0.01$).

Relevance: Delivering a 22 J/cm² dose of energy compared to 3 J/cm² of energy had a greater effect on shear bond strengths than the choice of adhesive system or resin shade.

Résumé

Cette étude a examiné les forces de cisaillement par adhésion in vitro, de deux systèmes de collage. SingleBond Plus (3M ESPE) et Optibond FL (Kerr), lorsque les teintes A2 et A4 du composite Filtek Z100 (3M ESPE) ont été collés sur de la dentine humaine, en se servant soit de 3 ou de 22 J/cm² d'énergie lumineuse. Ces deux doses d'énergie ont été choisies en fonction de l'énergie que les étudiants donneront pour une restauration simulée de classe I, sur une molaire du maxillaire. Les données de résistance d'adhésion du cisaillement on été comparées avec une analyse de variance, suivie par de multiples tests de comparaison post-hoc de Fisher PLSD.

Une analyse à trois facteurs ANOVA montre que, globalement, la résistance au cisaillement était significativement plus élevée par ≈ 10.1 MPa dans les groupes qui avaient reçus plus d'énergie ($p<0.01$). Dans l'ensemble, les forces de liaison de cisaillement sont plus élevées pour la couleur plus claire A2 de Z100, et pour Optibond FL (Fisher PLSD $p<0.01$).

Conclusion : Fournir une dose d'énergie de 22J/cm², comparativement à 3J/cm² de l'énergie, a eu un effet plus important sur les forces de liaison pour le cisaillement, que le choix du système de collage ou la couleur de la résine.

Introduction

Microleakage between the tooth and restoration that is then followed by secondary caries is a major reason for the failure and replacement of resin restorations.[1-3] This suggests a mechanism of failure of the adhesive bond between the tooth and the restoration. Although there are many excellent bonding systems available, in most cases they are tested in the laboratory under ideal conditions and these test conditions probably do not reflect what happens clinically. For example, while it is recognized that inadequately curing the resin composite,[4-7] bonding to dry or wet tooth surfaces,[8-10] or bonding to sclerotic compared to normal dentin[11, 12] may adversely affect the bond strength, these conditions have been difficult to quantify.

How well are resins polymerized in the tooth, how wet is too wet, or how sclerotic is the dentin?

Achieving an effective cure of the resin-based material in the tooth is an important clinical variable in the resin restoration system. The brightness of curing lights is termed irradiance (also referred to as power density) and is usually expressed in mW/cm^2. Although manufacturers and researchers commonly refer to the average irradiance measured across the tip of the curing light, this value gives little information about how much actual energy (dose) is received by the resin restoration. This energy density (E) can be quantified as the mathematical product of the light irradiance (I) received and exposure time (t), i.e. E = I x t, and is usually expressed in J/cm^2.

Most bonding studies have been conducted using curing lights that are working properly, for the recommended light exposure time, and at a distance of 0mm away from the resin. This does not correspond to clinical conditions, where the margin at the floor of the proximal box in Class II restorations is often at least 7mm away from the light tip.[13-15] It is well known that this distance between the light tip and resin adversely affects the effective light irradiance available to photo-activate the resin.[16, 17] Prati et al.[18] reported that even at short distances, i.e., 2mm away from the light guide, the irradiance falls to 61% of the original irradiance; and at 6-mm the irradiance falls to only 23% of the original irradiance. A recent ADA report found that moving from 2 to 9mm from the end of the light guide incurred a 68% reduction in the irradiance for the Bluephase 16i LED (Ivoclar-Vivadent, Amherst, NY), a 52% reduction with the Demi Plus LED(Kerr, Orange, CA), and a 35% reduction with the Fusion LED (DentLight, Richardson, TX) curing lights.[19] Thus, the bottom of the proximal box where secondary caries most often occurs,[20] receives the least amount of light compared to the top surface, and consequently the bottom of the proximal box may be where the resin is less well cured.

Bulk fracture of the resin composite restoration is another common cause of failure.[1-3, 21] It has been well-reported that reduced levels of resin polymerization caused by delivering an inadequate dose of light energy adversely affects many properties of the resin composite. These include: reduction of the mechanical properties such as strength, stiffness, and hardness;[22, 23] higher wear;[24-26] weaker bonding of orthodontic brackets;[27] lower bond strength of resin to the tooth;[4-7] greater "washout" of the resin composite at the gingival margin;[28] increased bacterial colonization of the resin;[29] reduction of color stability;[30, 31] and increased resin cytotoxicity.[32-35] While these adverse effects are known, the impact of these effects under normal clinical conditions is unknown.

Although no resin manufacturer recommends undercuring their products because they know that the properties of undercured resins are less than ideal, until recently the amount of energy (dose) delivered clinically was un-measurable. This problem is now partly solved because the energy density delivered to simulated restorations can be reliably and accurately quantified by

the MARC System.[36, 37] A recent study[36] using current correctly functioning curing lights demonstrated that the clinician's ability to use curing lights is an important clinical variable. The ability of 20 dental professionals to deliver energy to simulated restorations in a dental mannequin was examined. When the same curing light was used on the same tooth for the same exposure time, there was a large variation in how much energy the operators delivered (2.6–11.7 J/cm^2 using one light, and 6.1–14.2 J/cm^2 using a different curing light in the standard modes for 10 seconds). The majority of participants (82%) in this study [36] delivered less than 10 J/cm^2 and the lowest dose delivered was 2.6 J/cm^2. This is an inadequate energy density to cure most resin composites and would adversely affect the physical properties of the resin restoration.[23, 26] This large difference in the ability of clinicians to deliver an adequate energy dose to a restoration may help to explain why the median longevity of direct posterior resin restorations placed in dental offices has been reported to be as low as only 6 years.[38, 39]

Research Design:

This study first measured the energy density delivered by 71 students to the same simulated molar restoration. This established a clinically relevant range of energy that could be delivered to a restoration. Then it was determined if there was any difference in the in vitro dentin shear bond strengths (SBS) of two adhesive systems when they received the highest or the lowest energy density delivered by the students. Secondly, because delivering less energy may have a greater effect on darker shades of resin,[40, 41] two different shades of resin composite were evaluated.

The first null hypothesis tested was that delivering a clinically relevant amount of energy would have no effect on the shear bond strength of dental adhesives to dentin. The second null hypothesis tested was that there would be no difference in the shear bond strengths when two different shades of resin composite were used.

Methods:

To determine the clinically relevant energy density levels to use in this study, a preliminary assessment of the energy density delivered to a maxillary left second molar was measured for 71 dental students using the MARC-Patient Simulator (BlueLight analytics, Halifax, NS, Canada). From these results, a high of 22 J/cm^2 and a low of 3 J/cm^2 of curing energy were determined. These values are similar to those reported in a previous study.[36]

Following approval from the Dalhousie University Human Research Ethics Board, one hundred extracted human molar teeth were collected and stored in 0.5% w/v Chloramine-T-Hydrate (Aldrich Chemical Co., Milwaukee, WI) at 6°C prior to their use. The teeth were thoroughly washed in water for 7 days and mounted in acrylic resin (Trayresin, Dentsply International Inc., York, PA). The buccal surface of the teeth was removed using a sequence of 120, 240, 400 and 600 grit silicon carbide papers with copious water coolant to approximately halfway between the dentoenamel junction and the pulp. This location was thought to most accurately represent the depth of a typical cavity preparation. Following preparation, eighty-eight teeth were selected, coded, and randomly assigned into each group. Just before etching and bonding, the exposed dentin was rubbed on wet 600-grit silicon carbon paper to create

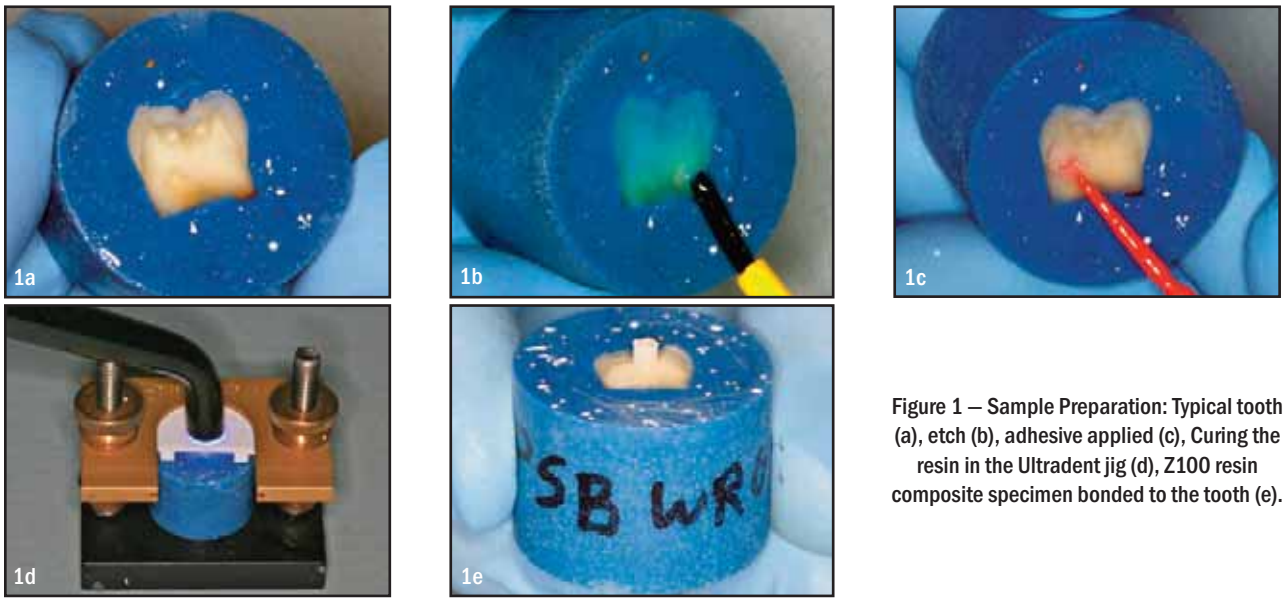

Figure 1 — Sample Preparation: Typical tooth (a), etch (b), adhesive applied (c), Curing the resin in the Ultradent jig (d), Z100 resin composite specimen bonded to the tooth (e).

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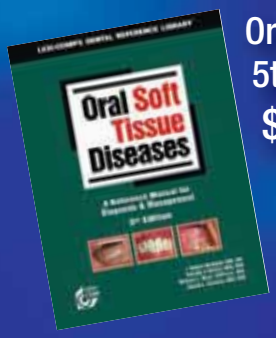

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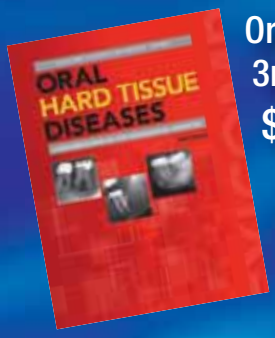

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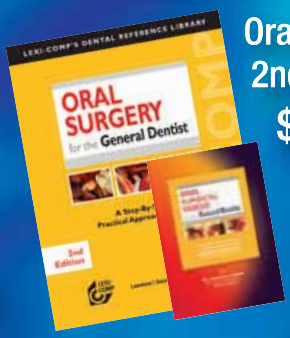

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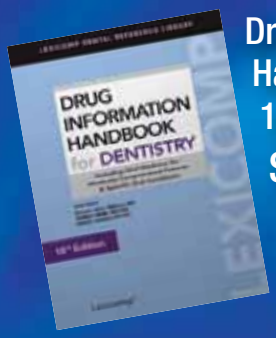

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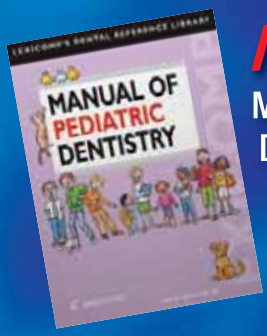

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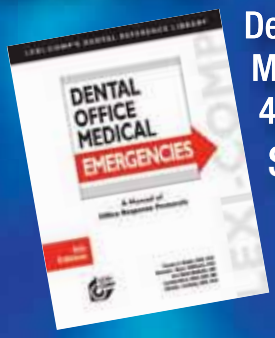

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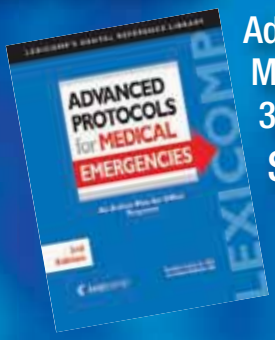

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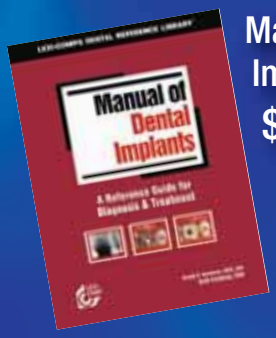

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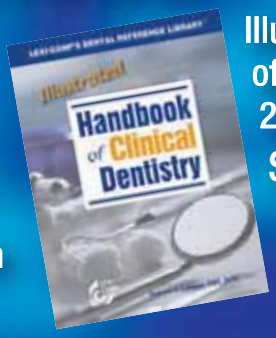

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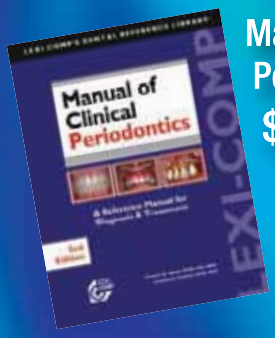

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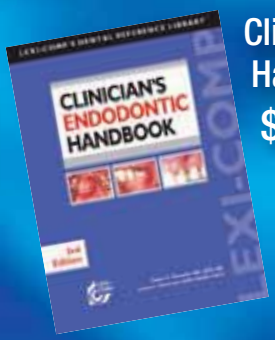

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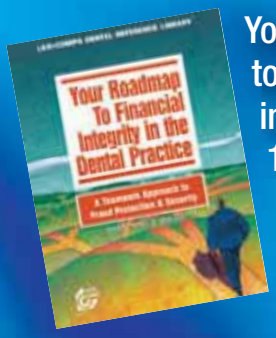

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a standardized smear layer. The teeth were then rinsed with distilled water at 37°±1°C to remove any debris.

For bond strength testing, two disparate but clinically relevant energy values (22 J/cm^2 and 3 J/cm^2) were delivered to either Optibond FL (Kerr) or Single Bond Plus (3M-ESPE, St. Paul, MN) adhesives using a SmartLite iQ2 LED (Dentsply). The curing light was mounted in the MARC-RC (BlueLight analytics) to deliver the required irradiance and 3 J/cm^2 or 22 J/cm^2 dose of energy to the specimens. Optibond FL adhesive was selected because it has been described as the "gold-standard" three-step etch-and-rinse adhesive, achieving excellent clinical and laboratory test results.[42, 43] Single Bond Plus adhesive was selected to represent a popular single step, etch-and-rinse adhesive system. Each adhesive was used in accordance with the manufacturer's instructions on the human dentin specimens in a predetermined randomized sequence.

The dentin surfaces were etched according to the manufacturer's instructions, rinsed with distilled water, and excess water removed with oil free stream of air, leaving the surfaces moist. The adhesives were applied to the dentin surface with a brush; air thinned, and then light cured using either 3 J/cm^2 or 22 J/cm^2 of energy from the SmartLite iQ2 (Dentsply). Approximately 2mm thickness of either shade A2 or A4 of Filtek Z100 (3M ESPE, St. Paul, MN, USA) resin composite was then carefully packed into an Ultradent bonding jig (Ultradent Products Inc., South Jordan, UT) placed on the dentin part of the tooth. The specimens made in the Ultradent jig were 2.4mm in diameter and they were cured in one increment from the top of the mold with the SmartLite iQ2 delivering either 3 J/cm^2 or 22 J/cm^2. This 2mm thickness of Filtek Z100 was within the manufacturer's recommended maximum thickness.[44] The specimens were stored for 24 hours in water at 37°C before they were subjected to a shear bond strength (SBS) test using the Ultradent half-moon blade test in a universal testing machine (Instron 3344, Instron, Norwood, MA) at a crosshead speed of 1.0 mm/min.[45] The shear bond strength (SBS) values (MPa) were calculated from the peak load at failure divided by the surface area of the specimen. Eleven specimens were made with each combination of energy, shade and adhesive system (for a total of 88 specimens). The results were compared using three-way ANOVA and Fisher's PLSD (α=0.01).

Results:

The SBS values for the different combinations of curing energy, adhesive and shade of the overlying composite are reported in Table 1.

Table 1: Effect of Energy, Adhesive System and Shade on Shear Bond Strength of Z100 to Dentin (Mean ± Standard Deviation)

Adhesive System, Energy Used, Shade	Mean Shear Bond Strength (MPa)	S.D.
Optibond FL, 22J/cm^2, A2	49.1 [a]	3.32
Optibond FL, 3J/cm^2, A2	40.9 [b]	4.34
Optibond FL, 22J/cm^2, A4	48.3 [a]	6.46
Optibond FL, 3J/cm^2, A4	33.9 [c]	3.58
SingleBond Plus, 22J/cm^2, A2	46.4 [a]	3.88
SingleBond Plus, 3J/cm^2, A2	36.6 [c]	4.20
SingleBond Plus, 22J/cm^2, A4	42.4 [b]	3.16
SingleBond Plus, 3J/cm^2, A4	34.6 [c]	6.66

Superscript letters [a, b, or c] indicate SBS values that were not significantly different, Fisher's PLSD (α=0.01)

Table 2: Improvement (%) in Bond Strength When More Energy was Delivered

Condition	% Improvement
Optibond FL, 22J/cm^2, A2 Z100 vs. Optibond FL, 3J/cm^2, A2 Z100	20
Optibond FL, 22J/cm^2, A4 Z100 vs. Optibond FL, 3J/cm^2, A4 Z100	42
SingleBond Plus, 22J/cm^2, A2 Z100 vs. SingleBond Plus, 3J/cm^2, A2 Z100	27
SingleBond, 22J/cm^2, A4 Z100 vs. SingleBond Plus, 3J/cm^2, A4 Z100	23

Delivering more energy resulted in at least a 20% increase in bond strength, and up to 42% for Optibond FL when paired with shade A4 of Z100 (Table 2). Overall three-way ANOVA established that delivering more energy resulted in a 10.1 MPa greater shear bond strength value ($p<0.01$). Overall, Optibond FL produced greater bond strengths by 3.1 MPa ($p=0.003$). Overall, the A2 shade produced a 3.5 MPa greater bond strength ($p=0.0008$) than the A4 shade.

Discussion:

Previous research has shown that the energy density (dose) delivered to the resin is often far less than the clinician assumes, and is often much less than the resin requires.[36, 37, 46] This study compared the bond strengths of two different adhesive systems and two shades of resin composite when light cured using clinically related amounts of energy. The data rejects the hypothesis that the shear bond strengths to dentin are unaffected when two disparate, but clinically relevant amounts of energy were used. Overall, the SBS was 10.1 MPa higher in the specimens that received 22 J/cm^2 compared to those specimens that received 3 J/cm^2 ($p<0.01$). Studies have shown that shear bond strength is affected by the properties of the composite used to produce the resin composite button bonded to the tooth, most specifically the elastic modulus.[47] Curing the Z100 with a low amount of energy most likely led to a reduced elastic modulus compared to that achieved with the higher amount of energy, thus contributing to the lower SBS for the former. This study verifies that curing the adhesive and the composite with insufficient energy will lead to significantly reduced bond strength (up to 40%), independent of adhesive brand or composite shade.

As anticipated from previous studies, overall the shade A2 produced greater bond strength than the A4 shade of composite (by 3.5 MPa).[40, 41] The lower SBS for the A4 shade was likely due to enhanced absorption of the curing light energy by the more heavily pigmented shade of Z100 resin composite, thus reducing the total light energy available for initiating polymerization. It is important to note that the relevance of the shade effect is secondary to applying sufficient curing energy, because the difference between the A2 and A4 shades was significant for both adhesives only when the low and insufficient level of light energy was delivered. When the higher curing energy (22 J/cm^2) was delivered, the shade effect became insignificant, as sufficient curing energy was available.

Prior surveys of the light output from curing lights used in private practices have consistently shown that the output from many curing lights is inadequate for curing resin adhesives and composites and many of the lights tested even had resinous debris on the tip surfaces.[48-51] In the present study, the low energy dose of 3 J/cm^2 was greater that the 2.6 J/cm^2 minimum that a clinician delivered in a previous study that measured how much energy was delivered to a tooth.[36] Delivering a dose of 22 J/cm^2 compared to 3 J/cm^2 resulted in an average 10.1 MPa greater bond strength. This effect was much greater than the overall average difference in bond strengths of 3.1 MPa between the two adhesives. In other words, this study determined that delivering sufficient energy was more important than the choice of adhesive system. Consequently, to optimize clinical outcomes, clinicians should monitor output from their curing lights on a regular basis to ensure that the unit is functioning optimally. A simple expedient of regularly cleaning the surface of the curing tip of adherent resin and regularly verifying the light output using a radiometer can be expected to influence adhesive performance and resin restoration lifespan.

The MARC-PS (Managing Accurate Resin Curing - Patient Simulator) device used in this study uses a laboratory-grade, fiber-optic spectroradiometer to measure irradiance, energy density, and wavelengths delivered to simulated restoration areas under clinical conditions. With use of this device, clinicians can easily measure the actual energy density (dose) delivered by their curing light. They can also clearly see how small changes in their chair-side techniques can have a significant impact on the amount of light they deliver. The acronym CORE (Curing light, Operator technique, Restoration characteristics and Energy requirement) summarizes the variables that govern successful light-curing.[52] Each variable needs to be managed and mastered by the clinician in order to have clinical confidence that the properties of resin restorations reach those intended by the manufacturer.

Table 1 shows that the three-step etch and rinse Optibond FL produced the greatest bond strengths. This supports previous studies showing that a three step phosphoric acid etch and rinse followed by an adhesive agent delivers the highest bond strengths.[42] However, the difference between the two adhesives was not consistent across the test conditions. The two adhesives had equivalent SBS at high curing energy when the A2 shade was used, but Optibond FL had higher SBS compared to SingleBond Plus when the A4 shade was used. When 3 J/cm2 of curing energy was delivered, there was no difference in SBS between the adhesives when A4 shade was used, but the SBS for Optibond FL was higher for the A2 shade. Since the composite should have been cured to the same degree, these differences must be attributable to the adhesives themselves.

This preliminary study could be expanded to include additional curing lights delivering high irradiance levels for short time periods (less than 5 seconds), and measurement of bond strengths at energy levels other than the 3 and 22 J/cm^2 doses selected in this study. Other questions raised, such as bond durability relative to the resin degree of conversion, could also be investigated. On a final note, it is to some extent a testament to the quality of these two adhesives that they both showed relatively high shear bond strength to dentin, even when a very low energy density was delivered.

Conclusions:

It is recommended that the clinician always deliver sufficient light energy to cure both the resin adhesive and the composite restorative in the oral cavity. Within the limitations of this in-vitro study, it was concluded that:

1. Overall, the shear bond strength was significantly higher (10.1 MPa) when 22J/cm^2 was delivered compared to those specimens that received 3J/cm^2 (Fisher's PLSD $p<0.0001$).

2. Overall, slightly lower bond strengths (3.5 MPa) were achieved when the darker A4 shade of Filtek Z100 was used compared to shade A2 (Fisher's PLSD $p=0.0008$).

3. Overall, Optibond FL produced slightly greater bond strengths (3.1 MPa) compared to SingleBond Plus (Fisher's PLSD $p=0.003$).

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Author declaration

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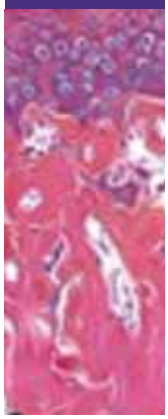

Osteoarthritis: Similarities Between Peripheral Joints and the Temporomandibular Joint

L'osthéoarthrite: Similitude entre les articulations périphériques et l'articulation temporomandibulaire

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Abstract

Osteoarthritis (OA) also known as degenerative arthritis or degenerative joint disease or osteoarthrosis is a group of mechanical abnormalities involving degradation of joints, including articular cartilage and subchondral bone. OA affects peripheral joints and the temporomandibular joint. This review will discuss the similarities between peripheral OA and temporomandibular joint OA.

Résumé

L'ostéoarthrite (OA), également connue sous le nom d'arthrite dégénérative, de maladie articulaire dégénérative ou d'arthrose, fait partie d'un groupe d'anomalies mécaniques concernant la dégradation des articulations, y compris le cartilage articulaire et l'os sous-chondral. L'ostéoarthrite affecte les articulations des membres inférieurs et supérieurs, ainsi que l'articulation temporo-mandibulaire. Cette revue permettra de comparer les similitudes entre l'ostéoarthrite des membres inférieurs et supérieurs et l'ostéoarthrite de l'articulation temporo-mandibulaire.

Introduction: Background and Significance

Osteoarthritis represents failure of the diarthrodial (synovial) joint. The pathologic hallmark of OA is the progressive loss of articular cartilage over the habitually loaded areas of the joint surface. OA is not a disease of cartilage tissues solely but it affects all of the tissues of the joint (synovium, subchondral bone, capsule, ligaments) periarticular muscles and the sensory nerves whose termini lie within these tissues.

This review will discuss the similarities between peripheral OA and temporomandibular joint (TMJ) OA. We will draw on studies of the human condition (knee) and in animal models to make these comparisons.

OA is a common chronic disease which progresses from initial stages with relatively few impairments and pain to an advanced disease with severe impairment of joint function. The frequently observed familial clustering of primary OA leads to the characterization as an oligogenic, multifactorial genetic disease[1]. OA progression results in limitation of joint motion (walking, running, chewing) and contractures (shortening of muscle/joint) in the affected joint and is often accompanied by pain. Initially, this occurs directly associated with motion and later even during rest. Research studying synovial and cartilage tissue samples of patients with OA supports the hypothesis that chondrocytes are one major site of production of the mediators of inflammation in human OA[2]. Evidence suggests that catabolic cytokines are mediators rather than markers of joint degradation in OA[3]. Lavage studies support these observations in the knee and TMJ and will be discussed later in this paper.

OA progression is not limited to articular cartilage, but also affects subchondral bone, as well as adjacent connective tissue and the synovial membrane, resulting in pain, swelling, progressive deformity, and instability. OA

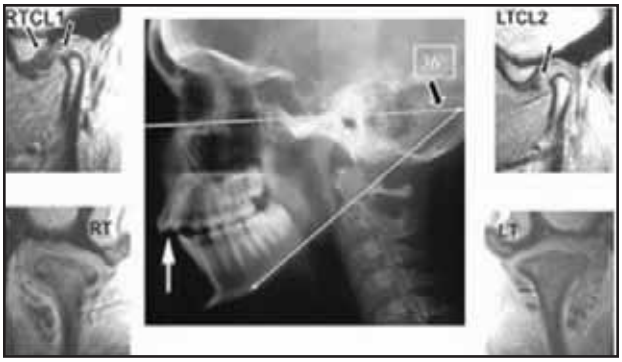

Figure 1 — Cephalometric x-ray (center) and magnetic resonance sagittal images of the right and left condyles in the closed and coronal views. The sagittal view of the right condyle demonstrates sclerosis and osteophyte formation. The right coronal view appears flat and small. The left sagittal view of the condyle appears small, sclerotic and the disc is anteriorly displaced. The left coronal view appears small and irregular. These finding are indicative of degenerative joint disease.

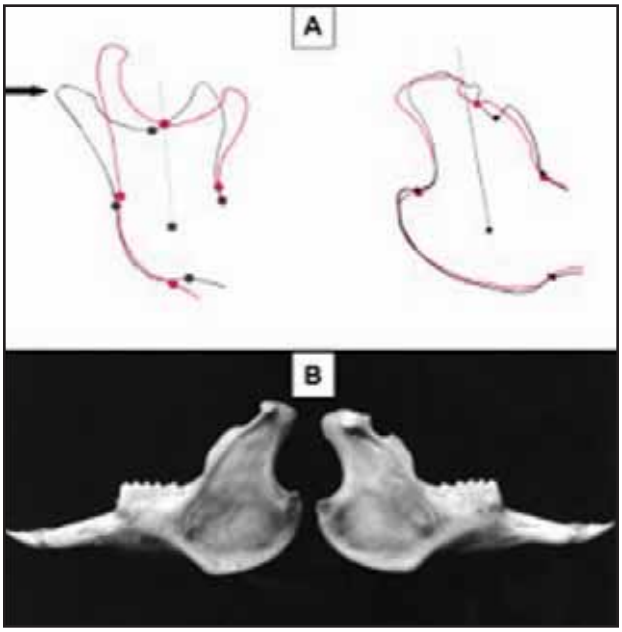

Figure 2 — A. Left drawing is an overlay of a normal condyle and ramus of humans (red) and bilateral DJD subjects (black). Note the shortening and tilting of the condylar head. The same is true in the rabbit on the upper right. The dry bones (B) of the rabbit demonstrate flattening of the anterior aspect of the condylar head as well as widening of the condyle in an anterior-posterior direction.

occurs in many joints such as the knee, hip, hand, facet joints and temporomandibular joint. However, patients suffering from OA often show a discrepancy between objective findings gathered in clinical, X-ray and/or MRI examinations and patient-reported pain and functional restrictions[4]. A sudden onset of disabling joint pain and articular effusion is a typical clinical feature of contractures (muscle and or joint shortening). This is recognized as activated OA. On a cellular and subcellular level, pro-inflammatory agents such as interleukin 1 (IL-1), NO and tumour necrosis factor-α (TNF-α) are over expressed in chondrocytes and joint stromal cells in OA[5,6]. Activated articular chondrocytes produce large amounts of nitric oxide (NO) and there is increasing evidence that this is involved in osteoarthritis (OA). Lai et. al.[7] have demonstrated that inducible nitric oxide synthase (iNOS) transcript levels were also significantly increased in the experimental group as compared with the control group. Studer et.al.[8] have also demonstrated that inhibition of nitric oxide attenuates the progression of experimental OA. This occurs in many joints; the knee, hip, hand, and facet joints are most affected[9].

Temporomandibular dysfunction (TMD) is a generic term for a number of clinical signs and symptoms involving the masticatory muscles, temporomandibular joints (TMJ's) and associated structures.[10] We will demonstrate the similarities between TMJ osteoarthritis and peripheral joints, primarily in the knee. Focus on the prevalence of disc displacement in the temporomandibular joint (TMJ) in asymptomatic volunteers and symptomatic subjects with pain. The effects OA has on facial growth, mandibular function and pain as well as the epidemiology of the condition will be discussed. Human (control and experimental), animal and cephalometric studies will be employed to demonstrate the effect on the TMJ and other joints. Molecular markers, levage studies, magnetic resonance imaging and plain films will be utilized to envision the similarities of OA.

Thilander et al.[11] have found that skeletal deformities are associated with posterior cross bite, anterior open bite, Angle Class III malocclusion, and extreme maxillary overjet. Anterior open bite and extreme overjet represent shortening of the condylar process. These skeletal findings affect subchondral bone, connective tissue and the synovial membrane. This often results in pain, swelling, progressive deformity and instability as occurs in other joints.

We suggest that disc displacement (DD) is often associated with DJD (degenerative joint disease), anterior open bite and extreme maxillary overjet which represent skeletal deformity and/or contracture. (Figure 1)

The Prevalence of DISC Displacement of the TMJ in A Symptomatic Volunteers and Symptomatic Subjects

Disc displacement (DD) of the TMJ has been suggested to

be common in symptomatic and asymptomatic subjects. A Magnetic Resonance Imaging (MRI) finding in 82 asymptomatic volunteers and 263 symptomatic adult patients has demonstrated the prevalence of DD to be 33% in asymptomatic volunteers and 84% of the symptomatic patients.[12] Ribeiro et al,[13] found the prevalence of DD (disc displacement) in asymptomatic children and young adults (6-25 years of age) was 34%, whereas DD was 86% in symptomatic children. These studies[12,13] suggest DD in symptomatic children and young adults are similar, suggesting that the potential for joint remodeling (osteoarthritis) may start at a young age. The prevalence of OA/DJD for symptomatic adults was 18% and was 17% for symptomatic children. These data would suggest that DJD is common in symptomatic patients and may effect mandibular growth.

Nebbe and Major[14] have also suggested that disc displacement is common in children presenting for orthodontic treatment. In fact Kamelchuk et al.[15] found the prevalence of disc displacement is 45% in children seeking orthodontic treatment.

A recent study by Thilander et al.[16] suggests that one or more clinical signs of TMD were present for 25% of the subjects, aged 5-17 years and most were mild in symptoms The prevalence increased during the developmental stages. Girls were more affected than boys. Significant associations were found between different signs, and TMD was associated with posterior crossbite, anterior open bite, Angle Class III malocclusion, and extreme maxillary overjet.

Disk Abnormalities in other Joints

Other joints (knee, cervical spine, and lumbar spine) have been studied in asymptomatic volunteers. Abnormalities in the absence of pain ranged from 16%-33%, again suggesting joints may have abnormalities in the absence of pain.[17-21]

Animal Models of DISC Displacement

Tallents et al.[22] and Hatalla et al.[23] evaluated the skeletal effect of surgically created unilateral disk displacement in the young New Zealand White rabbit. The gross appearance of the condyles demonstrated shortening and flattening of the articulating surface in the experimental group, suggesting arthritic changes. (Figure 2)

The previous authors[22,23] demonstrated that there was loss of proteoglycans (PG's) in the experimental animals. PG's give cartilage its tensile stiffness and compressive strength, allowing the disc to distribute the load. Loss of PG's may allow the disc to fragment and deform.

Qadan et al.[24] investigated the effect of unilateral TMJ disc displacement on the mandibular condyle, midface and cranial base in New Zealand White Rabbits. The occlusal radiograph demonstrated that the glenoid fossa on the experimental side was located more anterior and was remodeled. (Figure 3) This suggests an alteration of the cranial base induced by disc displacement and an asymmetric cranial base.

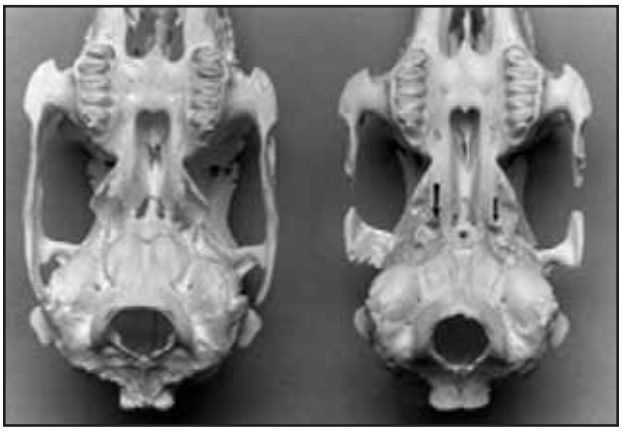

Figure 3 — The left skull (control) and right (experimental) are demonstrated. Note in the control animal (A) the glenoid fossa and foramen ovale are symmetric. In experimental animal (B) the glenoid fossa has remodeled and foramen ovale are more anterior, suggesting a lack of growth on the experimental side.

Bryndahl et al[25], in rabbits, has suggested that bilateral non-reducing TMJ disk displacement retarded mandibular growth, similar to the mandibular retrognathia seen in humans. Bilateral surgical displacement of the rabbit TMJ disks during the growth period induced condylar cartilage adaptive reactions that were associated with an adverse amount and direction of mandibular growth, manifesting in a retrognathic mandibular growth pattern.

TRANSGENIC ANIMAL STUDIES

Lai et al. (7) has induced osteoarthritis in the TMJ in a mouse model in a somatic mosaic analysis of transgenic mice with an inducible IL-1β transcription unit. There was an up regulation of cyclooxygenase 2, IL-6, matrix metalloproteinase 9. Behavioral changes, including increased orofacial grooming and decreased resistance to mouth opening, were used as measures of nociception and joint dysfunction, respectively. There was a significant increase in expression of the pain-related neurotransmitter calcitonin gene-related peptide (CGRP) in the sensory ganglia as well as the auxiliary protein CGRP receptor component protein of the calcitonin-like receptor in the brainstem further substantiated the induction of pain.

These data would suggest that the possible development of neuropathic pain may be associated with an up regulation proinflammatory cytokines (ie Il1β, CGRP). This somatic mosaic model induces joint changes similar to arthritis (osteoarthritis) that alters condyle morphology

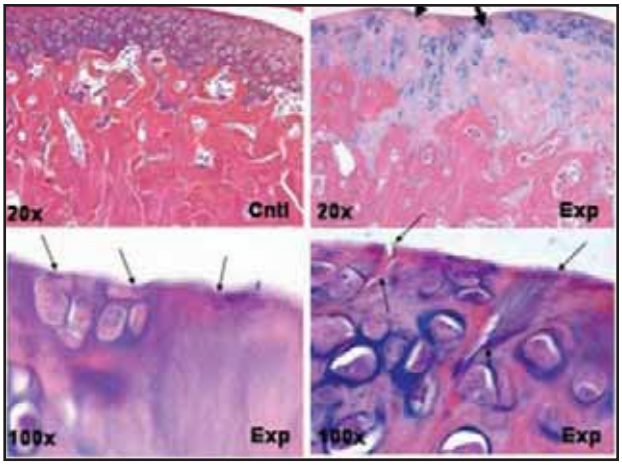

Figure 4 — Histology from normal control mouse (upper left). Note the columnar pattern of the cells (control). The TMJ from an experimental mouse, in a novel transgenic mouse with an inducible IL-1β transcription unit. Transgene activation was induced by Cre-recombinase in the temporomandibular joint of adult transgenic mice (conditional knock in model). Note the irregular surface and depth of the articular surface compared with the upper left slide. At higher-magnification (lower right and left) there is abnormal cartilage architecture with cellular disorganization and chondrocyte hypertrophy is evident. Arrows indicate lacunae forming on the surface of TMJ condyle in experimental mice.

(flattening, shorter and direction of growth). (Figure 2 A and 2 B and 4)

LAVAGE STUDIES

1. Studies in the Knee

Bonnett and Walch[26] in a review suggest that angiogenesis regulators were localized to or released within osteoarthritic human synovium, synovial fluid and articular chondrocytes. Niissalo et al.[27] has also suggested neuropeptides are involved in degenerative arthritis. Smith et al.[28] found evidence of thickening of the lining layer, increased vascularity, and inflammatory cell infiltration in synovial membranes from patients with all grades of OA in the knee. Cuellar, et al.[29] evaluated biomarkers in acute knee pain. They found intra-articular concentrations of four inflammatory cytokines IFN-g, IL-6, MCP-1, and MIP-1b to be correlated to pain in patients with symptomatic meniscal tears in the knee but were markedly lower in asymptomatic normal knees and in asymptomatic knees with meniscal tears.

2. Temporomandibular Joint

Segami et al.[30] found evidence of joint effusion (JE) on MRI suggesting synovial inflammatory activity. This confirms the common consensus that JE probably reflects synovitis (cells capable of producing proinflammatory cytokines) especially because synovial hyperplasia plays key role in the pathogenesis of JE.

Mizui et al.[31] examined matrix metalloproteinase-2 (MMP-2) activity in synovial lavage fluid of patients with disorders of the TMJ. They explored the possible correlation between MMP-2 activity and radiological changes in 86 patients and 10 healthy volunteers. Symptomatic patients were divided into three group's based on arthrographic findings: no abnormality, but symptomatic (n=36), internal derangement (n=39), and osteoarthritis (n=11). Active MMP-2 was detected in 9/36 (25%) with no abnormality, 14/39 (36%) with internal derangement and 5/11 (45%) with osteoarthritis. No active form of MMP-2 was detected in the healthy volunteers (no abnormality or pain). Active MMP-2 was high in the internal derangement group and highest in the OA group (45%), which suggests that active MMP-2 plays an important role in joint degeneration (DJD). An interesting finding was that patients with normal but painful joints had a 25% detection rate for MMP-2.

Ijima et al.[32] injected IL-1β into the joint of the rat to study matrix metalloproteinase (MMP) activity of cultured rat temporomandibular joint (TMJ) chondrocytes and disc cells. They found that MMP9 and MMP3 were predominantly produced by disc cells, and these may be considered to play a pivotal role in ECM (extracellular matrix) degradation during pathological conditions of the TMJ, such as IL-1-induced TMJ arthritis. These findings are supported by the transgenic model of Lai et al.[7]

Kubotta et al.[33] utilized synovial fluid from 25 joints in 22 patients with internal derangement (ID) or osteoarthritis (TMJ-OA). There were 15 asymptomatic controls from 11 normal volunteers, and 10 osteoarthritic knee joints. There findings suggest increased levels of cytokines (IL-1 and IL-6) and synovial fluid protein (SF protein).[26, 28, 34]

The above studies suggest that IL-1β, IL-6, MMPs, total synovial fluid protein (7, 28, 30-35) and joint effusion are present in joints with pain and or osteoarthritis (i.e. the knee and TMJ) and are credible markers for cartilage breakdown.

3. Condylar Resorption and Dental Treatment

Condylar resorption has been associated with TMJ internal derangement. Also condylar fractures and connective tissue/ autoimmune diseases induce resorption. These features may or may not be present before and after orthodontic treatment and orthognathic surgery. In most cases, however, there is no identifiable precipitating event; hence the term "idiopathic condylar resorption" is used to describe the condition.[33] This would have a diagnosis of osteoarthritis, associated with DD in the TMJD (temporomandibular joint dysfunction). We would suggest that the above mentioned lavage studies provide evidence associated with cartilage degeneration. It just happens to

be rapid and unexpected in some patients. An example of severe resorption is seen in the MR image (Figure 1). This patient was sero-negative for rheumatoid arthritis.

The above studies suggest that asymptomatic volunteers have disc displacement, the discs may deform and patients may have pain.[12, 13, 14] In the symptomatic human studies, there is an increase in DD, proinflammatory cytokines[27, 28, 31-35], disc deformity[37, 38], jaw dysfunction[12, 13, 16] often associated with pain and dysfunction.[12, 13, 16]

We will now discuss the possible problems this creates with the occlusion and why this may not be preventable.

A recent study by Thilander et al.[16] has suggested that TMD was significantly associated with posterior cross bite, anterior open bite, Angle Class III malocclusion, and extreme maxillary overjet. These authors have further suggested that morphological malocclusions should be treated orthodontically at an early age to eliminate the traits of the anomaly. The question is whether or not these specific occlusal features (anterior open bite, cross bite and extreme maxillary overjet) can be corrected or not and may they relapse. Individuals with excess horizontal overlap, often with vertical open bite may be at risk for having pain in the TMJ, regardless whether they are treated orthodontically or in combination with orthognathic surgery. [39-42]

4. Human Cephalometric Studies

Bryndahl et al.[25] has suggested that bilateral non-reducing TMJ disk displacement retarded mandibular growth, in rabbits, similar to the mandibular retrognathia seen in humans.

Several authors have suggested that DD alters mandibular growth, sometimes resulting in a retrognathic facial profile.[43, 44,45] Gidarakou et al.[9] have compared the effects of DD on craniofacial morphology, particularly symptomatic bilateral DD patients with DJD. Cranial base, profile analysis, denture base patterns, and vertical relationships were compared in asymptomatic volunteers and symptomatic patients. These data suggest that the sagittal position and horizontal projection of the maxilla, mandible, and their respective denture bases might be affected in patients with bilateral DJD. Subjects with bilateral DJD had an A point and B point that were more retruded, a more obtuse mandibular plane angle (MPA), a shorter ramal height (SHR) as compared with normal asymptomatic controls (no DD). (Figure 5)

4. Orthognathic Surgery and TMD Symptoms

Several authors have examined orthognathic surgery patients both preoperatively and postoperatively and have found that patients presenting with high mandibular plane angles, Class II malocclusion featuring retrognathia (chin posterior) and/or open bite with vertical maxillary excess (long face) are more likely to have TMJ signs and symptoms preoperatively and are more likely to develop and or maintain the symptoms postoperatively.[40-47]

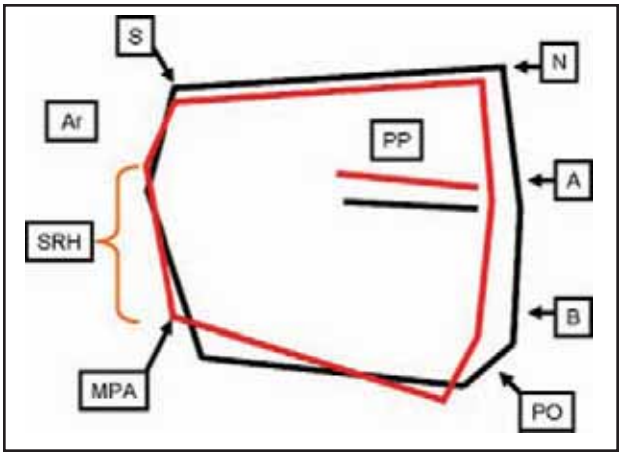

Figure 5 — This graphic compares the control (black) and experimental (red) subjects. These data suggest that there is a cant of the palatal plane (PP), points A and B are retruded, the Frankfort plane is more obtuse, and the ramus height is reduced. Compared to normal asymptomatic volunteers (black lines), note Sella Nasion is shorter in the bilateral DJD subjects, A point, B point and PO are more posterior. The mandibular plane angle (MPA) is more obtuse in the bilateral DJD subjects. The posterior face length is also shorter (SHR). This suggests that there is less forward growth of the face and less vertical growth.

Kerstens et al.[39] have demonstrated that patients undergoing orthognathic surgery, with no prior symptoms, might exhibit TMD after surgical treatment.

Open bite or large horizontal overlap of the incisors should be viewed as a risk factor before the initiation of orthodontics, prosthodontics, routine oral surgery (ie, third molar extraction), or orthognathic surgery. The skeletal features of these subjects might suggest an increased risk for mandibular pain and dysfunction. The above description might be an expression of condylar changes (OA) which has been suggested in several studies.[9, 39, 40-47]

Wolford et al.[41] suggested that any clinical or radiographic evidence of TMJ dysfunction, regardless of the severity of clinical symptomatology, warrants comprehensive assessment.

Epidemiologic Studies

Kaiser Permanente a health care provider in the state of Washington, recruited 160 women, aged 18-70 years seeking treatment for TMJ disorders, and 151 control women without TMJ disorders selected from adult female dental hygiene patients.[48,49] They found a strong association between TMJ disorders and severe mandibular retrognathia in adult women (odds ratio, 6.3). They suggested that in some women this resulted from TMJ

disorders influencing mandibular development over time. We would suggest that because of the prevalence of DD in asymptomatic children and young adults (34%)[12] and the prevalence of DD in children and young adults (45%)[13] presenting for orthodontic treatment, the environment for "less" growth might be present at a young age.

Examples of the influence of OA in young adults

Flores-Mir et al.[50] followed 40 subjects (21 girls, 19 boys) who had undergone orthodontic treatment between initial records (T1) and final records (T2). Mean follow-up time between T1 and T2 was 43.68 months. They suggested that TMJ disk abnormality was associated with reduced forward growth of the maxillary and mandibular bodies. This disk abnormality was associated with reduced downward growth of the mandibular ramus.

Nebbe et al.[14] compared bilateral DD patients with controls and found that the craniofacial pattern in individuals with bilateral DDN (disc displacement without reduction) is characterized by a reduction in posterior vertical face height. The palatal and mandibular planes show a more marked convergence toward the posterior region of the face in individuals with DDN compared with the group with bilateral normal disk position.

Conclusions

We have presented a possible relationship between cranial facial morphology and internal derangement. This condition seems to be related to DD and the arthritic process that "some" joints go through. We propose that the same proinflammatory cytokines, matrix degrading enzymes, and neurogenic processes found in joints are common to the knee[28,35], TMJ[30-34], and an animal model[7]. These joints have associated OA, pain and cartilage breakdown.

Author declaration

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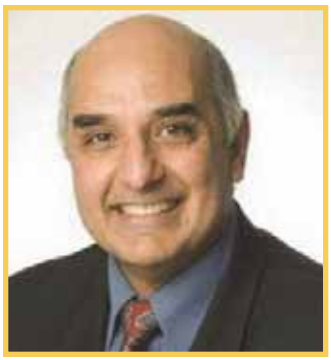

Welcome Our Incoming President

Bienvenue à notre nouveau président

Dr. Ash Varma

Dr. Varma graduated from UBC Dentistry in 1983 and joined his father in private practice in Powell River as a general practitioner, where he continues to practise today. Over the years he has been involved with organized dentistry at regional, provincial and national levels. As a member of the Gelfant-Nimchuk Study Club, they extended an invitation to Dr. Varma to join CAP which later became CARDP and he has been a member since 1987. He has also been a mentor of the Grief Point Study Club in Powell River, for the past 10 years.

Dr. Varma has been involved with the College of Dental Surgeons of British Columbia since 1986 starting as a member of the Peer Review Committee, becoming sub-chair and then onto the Ethics Committee which he chaired for five years. Elected to the College Board in 2001 and served in various capacities, culminating in being the President of the College for two years 2008-2010. He was given the Distinguished Service Award by the College of Dental Surgeons of BC in 2011 and is currently the chair of the Colleges' Quality assurance Committee. As a result of his College involvement, Dr. Varma has presented at the Pacific Dental Conference and other dental meetings throughout BC. He is also a member of the Board of Councillors at the UBC dental faculty, a sounding and advisory panel for the Dean. Dr. Varma has also been given fellowships by the Pierre Fauchard Academy, the American College of Dentists, the International College of Dentists and the Academy Dentistry International.

He has also been a member of the Rotary Club of Powell River for almost 27 years and has served as president. Awarded a Paul Harris Fellowship from the club for community service, over a sustained time frame. Dr. Varma is also on the Powell River Hospital Foundation Board, and is the liaison between the dental community in Powell River and the hospital. He coordinates emergency dental coverage for the community, and has done so for the past 25 years.

He also enjoys many activities with his family, especially travel to sunny climates, good food, wine, fishing, boating, golfing and hunting. He and his wife Deleigh are both involved with coaching track and field for their children, and the Powell River Track and Field club and is a certified level 2 track coach. Dr. Varma and Wife Deleigh have been married for 24 years and have two grown children, a daughter Anjani and a son Milan, as well as numerous pets.

New Members / Nouveaux Membres 2012

Albert	Dr. Daniel	950 Bedford Hwy, Suite 203	Bedford	NS	B4A 4B5
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Kutlesa	Dr. Marigana	605 Hwy 8	Stoney Creek	ON	L8G 5G2
Soo	Dr. Lange	210 15321 16 th Ave,	Surrey	BC	V4A 1R6
Wdaa	Dr. Widad J	106 Green Park Close	Halifax	NS	B3S 0A4
Miller	Dr. Robery J.	16244 S. Military Trail, Suite 260	Delray Beach	FL	33484-6505
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Nette	Dr. Andrew	9 Gaspereau Ave	Wolfville	NS	B4P 2C3
Hess	**Dr. Tim**	**1268 E Main Street**	**Auburn**	**WA**	98002

Annual Scientific Meeting / Congrès scientifique annuel-Halifax

2012 Conference Clinic Chair Dr. Mark Sutherland, President Dr. Maureen Andrea, Active Member Dr. Joanne Thomas and Essay Chair Dr. Peter Thomson

CARDP Honourary Members Dr. Don Coburn, Dr Emmanuel Rajczak with Fellow Member Dr. Andrew Coburn and Active Member Dr. Bruce Farlow

Fellow Member Dr. Brian Nord & Life Member Dr. Dan Macintosh at the Opening Reception

Guest Dr. Nancy Dubois and Fellow Member Dr. Hubert Gaucher

CARDP Past President Dr. Kim Parlett, 2012 President Dr. Maureen Andrea and incomign 2013 President Dr. Ashok Varma

Attendees at the Trade Show

Life Member Dr. Vernon Shaffner, Dianne Shaffner, Catherine Robertson & Active Member Dr. David Robertson

Dr. John Bembenek Presenting a Table Clinic

Essay Chair Dr. Peter Thomson Thanking Speaker Dr. Jim Kessler

Speaker Dr. Jim McKee and Essay Chair Dr. Peter Thomson

Ken Dickson from Aurum Ceramic Dental Labs & CARDP Active Member Dr. Francis LaCouvee

Speaker Dr. Charles Shuler and Essay Chair Dr. Peter Thomson

Saturday Afternoon Table Clinics

Guests being entertained at the Gala by the Singing Strings

Dr. Joel Powell presenting a Table Clinic

Table Clinician Participants

Delegates and Guests enjoying the evening entertainment, the Atlantic Canada Ceilidh

Clinic Chair Dr. Mark Sutherland introducing Speaker Dr. Kim Kessler

Guests enjoying the Lobster Dinner Entertainment

Dr. Richard Price presenting a Table Cinic

Honourary Member Dr. Emmanuel Rajczak Speaking

Dr. George Cho, presenting to the Conference

Past President Dr. Vernon Shaffner with Table Clinician Mr. Martin Mueller

Left to Right Peter Jacob 3M ESPE, Krista Waterhouse, Hilaire Jones & Dr. Janice Wilson, from Fredericton, NB

Fellow Dr. Robert David, Active Member Dr. Mary Currie & Fellow Member Dr. Jay McMullan at the meetings

Halifax Military Doctors joined the meeting

the 78th Regimental Highlanders from the Halifax Citadel National Historic Site with President Dr. Maureen Andrea and the Opening of the Conference

Delegates and Guests being led to a Lobster Dinner on Halifax's Waterfront

Delegates and Guests Boarding for a Halifax Harbour Cruise

Guests enjoying Kayaking in Lunenburg, Nova Scotia before the conference

CARDP Partners enjoying a tour of the Annapolis Valley and Wine Tasting

Delegates and Guests enjoying the Sites of Halifax by water

Harbour Tour entertainers Maggie and Cassie MacDonald

Attendees at the Trade Show (2)

Colleen Hood Doyls, Fellow Member Dr. Gorman Doyle and Honorary Member Dr. Derek Jones at the Opening Reception

Sue Letkemann, Life Member Dr. Larry Pedlar, Active Member Dr. Carolyn Poon Woo and Gary Leewing enjoying the opening reception

Canadian Journal of Restorative Dentistry & Prosthodontics
The official publication of the Canadian Academy of Restorative Dentistry and Prosthodontics
CJRDP
JCDRP
Journal canadien de dentisterie restauratrice et de prosthodontie
Publication officielle de l'Académie canadienne de dentisterie restauratrice et de prosthodontie

Call for Papers

Demande de communications

CARDP's Executive Board has concluded a publishing agreement with Palmeri Publishing Inc. The Academy's Journal (**CJRDP**/**JCDRP**) is published four times a year since 2008 with a circulation of 7,000. The 2013 Journal Production Schedule is accessible at http://www.cardp.ca/sitedocs/2013%20CJRDP%20Production%20Schedule.pdf
Scientific articles are Peer Reviewed. The Journal welcomes article contributions from its members, guest dentists and dental technologists as well as the dental Industry.

Editor: Dr. Hubert Gaucher

Associate Editors: Drs. Maureen Andrea, Emo Rajczak and Dennis Nimchuk

Section Editors: Drs. Kim Parlett, Ian Tester, Ron Zokol, Yvan Fortin, Paresh Shah, Izchak Barzilay, Peter Walford, Allan Coopersmith and Mr. Paul Rotsaert

I – Scientific Articles: (Original Research Studies, Reviews, Case Reports): Please refer to these "Instructions to Authors" for details. www.cardp.ca/sitedocs/CJRDP-Guidelines-PPI-PR1.pdf%2002-13.pdf

For Case Reports please review this information: http://www.cardp.ca/sitedocs/CJRDP-Case-Report-Authors.pdf

II – Member News: Please forward any news of interest to the Profession.

III – Young Authors Awards Fund: Financial contributions to this fund will recognize a dentist with 5 years' experience or less or a graduate student in Canada, with a $1,000 award for the best published article of the year.

IV – Dental Student Award Fund: Financial contributions to this fund will recognize a dental student in Canada, who will receive a $500 award for the best published article of the year.

V – Industry News and Product Profile Articles: New dental products, technologies and Industry services are presented to readers using articles that originate from the Industry and that are identified as such. This information is contained in the above "Instructions to Authors" and in the following Journal Media Kit: http://www.cardp.ca/sitedocs/MediaKit-2013-email.pdf

If you have comments or suggestions about submissions or would like to become more involved with the Journal, please contact the Editor:

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L'ACDRP a conclu une entente de publication avec Palmeri Publishing Inc. Le journal de l'Académie (**CJRDP**/**JCDRP**) est publié depuis 2008 et a une circulation de 7 000 exemplaires.
Il y a quatre parutions par année. La cédule de production 2013 du Journal est accessible à http://www.cardp.ca/sitedocs/2013%20CJRDP%20Production%20Schedule.pdf
Les articles scientifiques font l'objet d'une revue par des pairs.
Le Journal accueille des articles de ses membres, de dentistes et prothésistes dentaires invités ainsi que de l'Industrie dentaire.

Rédacteur en chef: Dr Hubert Gaucher

Rédacteurs associés: Drs Maureen Andrea, Emo Rajczak et Dennis Nimchuk

Rédacteurs de sections: Drs Kim Parlett, Ron Zokol, Yvan Fortin, Paresh Shah, Izchak Barzilay, Peter Walford, Allan Coopersmith et M. Paul Rotsaert

I – Articles scientifiques: (Recherches originales, revues, rapports de cas): Veuillez vous référer aux «Instructions aux auteurs» pour les détails. http://www.cardp.ca/sitedocs/CJRDP-Guidelines-PPI-PR1.pdf%2002-13.pdf

Pour le Rapport de cas, veuillez consulter le document suivant: http://www.cardp.ca/sitedocs/CJRDP-Case-Report-Authors.pdf

II – Nouvelles des membres: S.V.P. nous envoyer toute information pertinente à la profession.

III – Bourse pour les jeunes auteurs: Les contributions financières permettront de remettre une bourse de 1 000$ à un dentiste ayant moins de cinq ans de pratique et/ou à un(e) étudiant(e) diplômé(e) au Canada pour le meilleur article publié au cours de l'année.

IV – Bourses pour étudiant(e) en Médecine dentaire: Les contributions financières permettront de remettre une bourse de 500$ à un étudiant ou étudiante en Médecine dentaire au Canada pour le meilleur article publié au cours de l'année.

V – Nouvelles de l'Industrie et Articles publicitaires: Les nouveaux produits, technologies et services de l'Industrie sont présentés aux lecteurs utilisant des articles venant de l'Industrie et qui sont identifés comme tels. Cette information est contenue dans les «Instructions aux auteurs» ci-haut ainsi que dans la Trousse Média: http://www.cardp.ca/sitedocs/MediaKit-2013-email.pdf

Si vous avez des commentaires ou des suggestions ou si vous désirez vous impliquer davantage dans notre Journal, veuillez communiquer avec le Rédacteur en chef:

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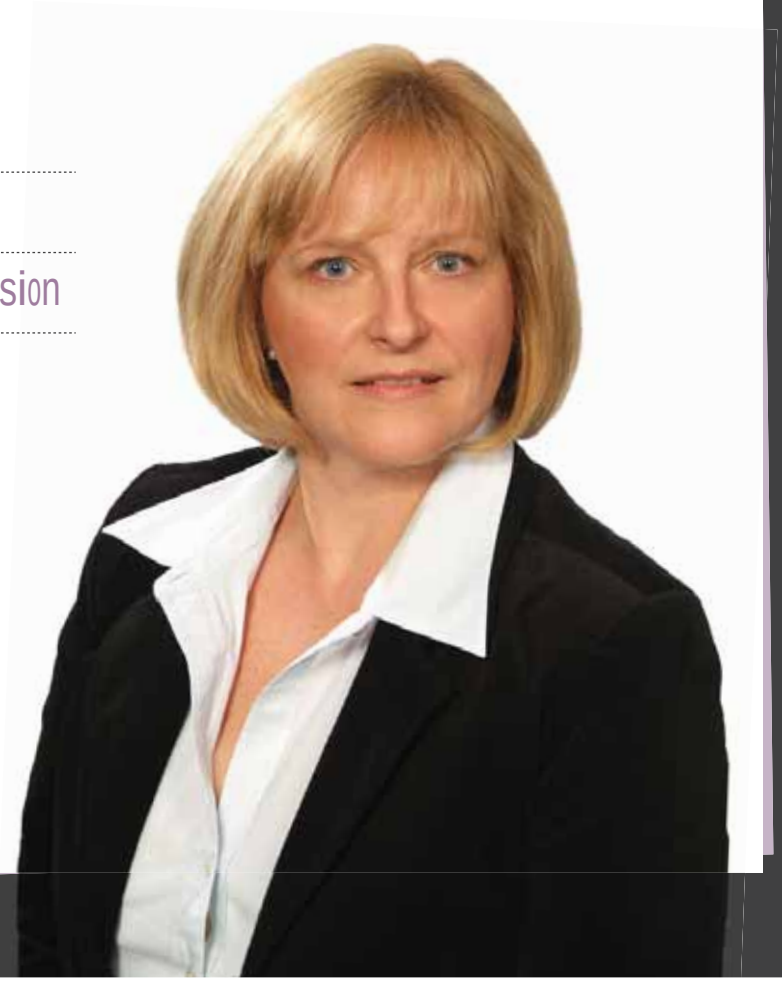

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Winning: The Team Approach to Patient Management

Nadean Burkett

In practice management systems the standard of performance measurement has been revenue – gross and net. In other words, how much money is being collected for the services being provided to the patients, and what is left over after all of the bills have been paid. That is an accounting method that may be great in retrospect but, what if there were a different way to quantify performance that would offer more predictable results for the future?

You are invited to consider that focus on the fifth "P" (Price) in your practice model may be distracting from the other four, and equally important components – People, Product, Position and Promotion. Why? By re-focusing on these (particularly People), you may find more satisfying results.

Follow these 5 simple steps to implement this new management model to your practice:

1. Define your practice mission statement (Hint: this is easier when you have clear vision, goals and philosophy). Done right, this is the only one of the 5 steps that will not be affected by change. This is the one part of the practice model that remains constant and should keep you focused when making decisions in good and bad times.

2. Describe your ideal practice in detail using each of the 5 Ps (People, Product, Position, Promotion and Price).
   - People – your Ideal Patient Profile (who is your ideal patient?) and attributes (strengths and limitations of your team – individually and as a group). How many patients are actively enrolled (have been seen for a recall examination in the past 12 months) in your practice currently? How many of the patients you see have referred friends or family to your practice in the past 12 months?How many people have been acceptedand enrolled (comprehensive new patient examination) in your practice in the past 12 months? How have these patients been referred to your practice? Describe your practice culture (trusting, respectful, communicative, flexible, creative, positive, solution-based problem solvers, open-minded, consistent, caring and compassionate, personable, pleasant, thoughtful, responsive, punctual, impulsive, reactive, critical, distrustful, secretive, negative, inconsistent, blaming, etc).
   - Product – what services do you offer to your patients and how are they delivered? What demand is there from existing patients for those services? How are patients informed and educated about the benefits of these services to them? Do you offer discounted or "free" services to attract new patients?
   - Position – Where is your clinic geographically located within your community? Are you in a retail or street-front position with visibility to pedestrian and/or vehicle traffic? Are you a tenant (renting) or do you own the facility? How is the community around you changing? What is the total cost of rent, taxes, HOA fees, mortgage, etc.?

- Promotions – What promotional activities do you employ to attract and retain patients? Describe these in relation to internal and external to the operation of your practice.

3. Create your policies – patient and employee management – guided by the above and considering what you want your practice performance to be (if it is not meeting your needs and expectations).

4. Adopt and adapt systems that will make your team more efficient and effective in their performance, and allow you to monitor that performance regularly.

5. Re-evaluate all of the previous steps on an annual basis (at least) considering how internal and external influences (changes) are impacting the relevance of each component (5 Ps), policies and systems.

This is an excerpt from our "Winning" seminar which will be delivered at the Vancouver and District Dental Society Mid-Winter Clinic on December 7th, 2012. For those unable to attend and as a reference guide, more on this topic will be available through the SMILE MORE section of our new web site, www.mypracticematters.com.

Your feedback continues to make us better. Visit www.mypracticematters.com for more informative, interactive career and practice management support and coaching services and to sign up for our newsletter.

Feedback and questions related to this article and web site are always welcome. Send yours to nadean@mypracticematters.com. Follow us on Twitter; like us on Facebook; join us on LinkedIn.

Author:

Nadean Burkett is a career and business transition coach with more than 30 years experience in the dental profession – now assistingaccountants and other professionals in private practice by referral. Trusted practice evaluator, business planner and respected coach andadvisor for the past 7 years - Nadean facilitates The EMPOWERMENT Program series, Career & Practice Management for Dentists bothonline and from NBAI's head office situated in beautiful Vancouver, British Columbia. Visit www.empoweredbynba.com emailburkett@empoweredbynba.com for listings, job postings, & more resources with your practice transition coach.

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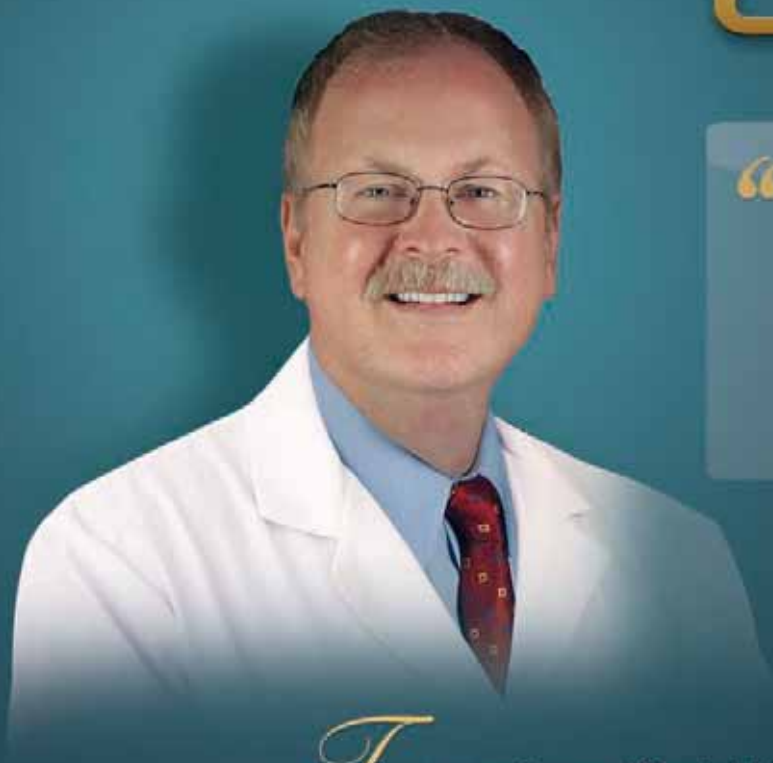

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